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The Lunkenheimer "Clip" Hose Gate Valve.

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FINEST MINE ON THE MONONGAHELA RIVER.

THE opening and operating of coal mines are being done more thoroughly than formerly. During the days when a coal miner with a few friends cut the ground about the coal level, erected a cheap tipple of lumber purchased a few mules and with second hand rails started a mine with picks, almost any one with a few thousand dollars could open a coal mine in this section. Today, capitalists match their money with the brains of the inventor and when a coal mine is opened it is equipped with the best money can buy. An illustration of this method is the new mine of the Clyde Coal Company, at Fredericktown, Pa., in the Fifth pool of the Monongahela river. It is the best equipped mine on the Monongahela river.

The company has acquired 1,034 acres of thick vein coal land. The illustrations show the opening of the mine which is protected by masonry at the opening. The tracks spreading about in various direction show how the cars can be switched from the mine to the tipple and back into the mine and how another switch leads to the gob pile. Everything about the opening denotes thoroughness. The picture of the tipple which stretches over the river shows a solidity of structure seldom accorded buildings of this class. The stone pier and abuttment supporting the tipple are well designed and strong. The tipple is built of steel and well lighted by windows as can be seen from the illustration. It has a capacity of from 3,000 to 4,000 tons of coal, a greater capacity than any tipple on the Monongahela river. The grade from the pit mouth to the tipple is such that loaded cars will run to the tipple by gravity. After the cars are dumped the empties are elevated by an automatic chain haulage device, installed by Bollinger Brothers, of this city. From the end of the chain haul the empties run back into the mine by gravity. The system used makes the handling and

screening of coal economical, as it dispenses with a number of men usually employed at the mines. The ventilation is gained by a Capell fan 16 feet in diameter, with a capacity of 250,000 cubic feet of air per minute. The tipple was designed by William Glyde Wilkins, civil and consulting engineer, Westinghouse building. The screens and chutes were furnished by the Phillips Mine Supply Company.

The mine is operated by electricity. The power plant consists of one 175 k. w. Westinghouse generator direct-connected to a 250 horse power Westinghouse steam engine, and two 72 inch by 16 feet horizontal tubular boilers. Foundations are being built for another 175 k. w. generator to be direct-connected to a 250 horse-power engine. Space has been left for four additional boilers, same size as those in use. The power house is built of stone and is considered the finest on the Monongahela river. The Company has built 40 double houses for miners.

Machine For Bending Plates.

GEORGE W. GREEN, an engineer of Littlechester, Derby, England, has obtained a patent in this country on a machine for bending metal plates known as "tunneling" or "tank" plates, by pressure. These plates have generally been cast, but by means of this invention they are made of wrought metal with or without corrugations. The principal difficulties of bending such plates are getting the compression blocks or dies to properly form the radiating flanged edges of the plates and removing the plates from the outer blocks or die after the plates have been bent and removing the inner blocks or dies from inside the plate. The machine overcomes these difficulties.

Two sets of pressure blocks or dies, are employed, the lower or outer set being operated by a ram and being preferably in halves with upwardly and inwardly inclined ends and free to slide in the guides or ways on a table, carried by the ram and guided by the uprights of the frame. Then the halves are pressed together, they form the lower or outer die the same shape as that to which the outer face of the plate is to be bent. Upon pressure being applied from below by the ram, the die, the inclined ends of the lower blocks or dies bear against the wedges or inclined faces of the fixed

blocks, secured to the framing and constituting abutments, and so the halves of blocks or dies are forced together. The joint between the halves may be of any type. Working in conjunction with the lower or outer blocks or dies is an upper or inner set of blocks or dies, the middle portion of which is fixed to the main frame of the machine, the side portions being dovetailed or otherwise fitted to the middle portion so that they can slide thereon at an angle corresponding to or approximating that of the flanges to be formed on the ends of the plate. The parts are also connected in any suitable manner to the rams. The pressure-faces of the lower or outer blocks or dies and the pressure-faces of the upper or inner blocks or dies are shaped to give the requisite form to the flanged plate to be produced. The rams are set at angles corresponding to or approximating the angles of the flanges to be producd on the end of the plate. Portions of the plate are cut away at each corner, to allow of the turning up of the flanges. The plate at the requisite temperature is placed upon the lower or outer set of blocks or dies, which are operated by the ram, until the plate touches the under side of the fixed central portion of the upper or inner set of blocks or dies, when the upper rams are set in motion (if they have not previously been set down) and pressure is brought to bear evenly all over the plate until the whole space between the blocks or dies is filled by the metal of the plate.

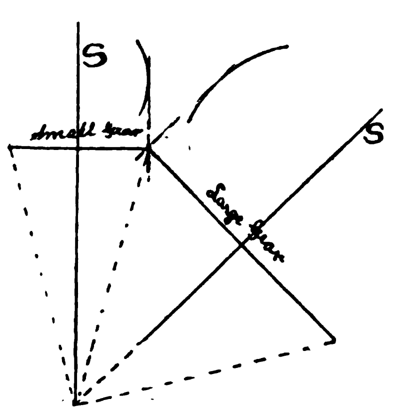
Any suitable stops or gags may be employed to limit or indicate the movement of the pressure blocks or dies, it being understood that the process is continuous and that the bending and flanging of the plate is preferably performed at one operation of the machine or apparatus.

To remove the formed plate, the lower ram is lowered, bringing with it the lower or outer pressure blocks or dies, which open longitudinally as they pass over the radially-flanged ends of the plate, their longitudinal movement being limited by the stops, if desired. The portions of the upper or inner blocks or dies are then withdrawn, (which may be effected by draw-off hydraulic rams, counterweights, screws, or other means,) thus liberating the plate, so that it can be readily removed.

PLOTTING BEVEL GEARS.

BY WILLIAM NEWTON.

TO show how a job may cause one to wander all over to get at the subject when it could be found close at hand I give my experience in plotting bevel gears. A bevel pinion of 13 teeth was brought to me with orders to make a pattern like it to take its place as the pattern might be destroyed at any moment while in use as it had seen hard service. I was told that its shaft stood at an angle of 48 degree, in position with that of its mate and thought the proportion was about three to one, but if I made one like the pattern it would be correct. To find the angle of the face and outside of the teeth was a difficult matter as all were badly damaged. I began floundering by dividing the number of degrees contained in the angle in the same proportion as the two gears were supposed to make. Comparing the angles with the inner and outer diameter of the sample gear, I learned my method of plotting was away off.



It occurred to me, after knowing what the proportions of the two gears really were, that if I set the dividers to the radius of one arc, letting one point rest on the centre line of the shaft, and treating the other the same, then drawing lines parallel with each shaft, until the lines met, it gave me at that point the angle at pitch line.

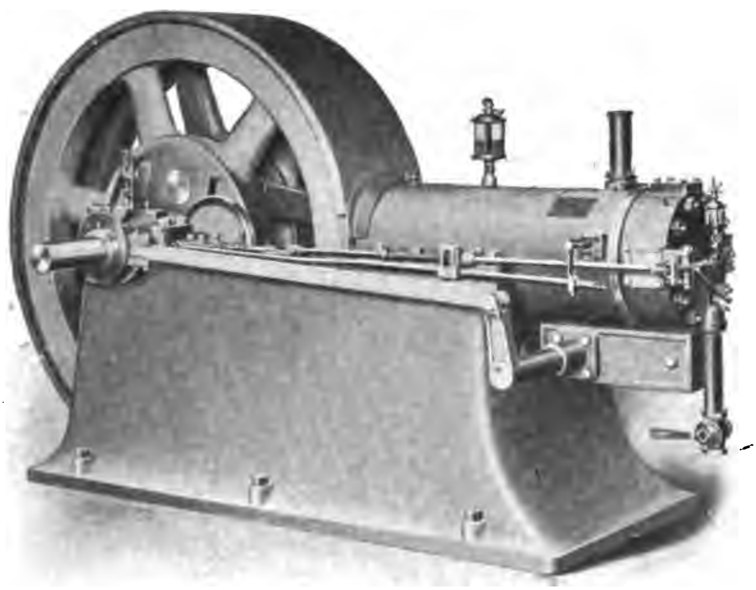
The sketch readily conveys the idea. The two lines marked S represent the two shafts at an angle of 45 degrees. More often they stand at right angles. This method answers for shafts at any angle calling for bevel gears.

THE "BRIGHTON" GAS ENGINE.

THE designer of the "Brighton" gas engine follows out the principle that a straight line is the shortest distance between two points. This well-known principle in engine construction was first brought out by Professor Sweet and consists essentially in placing two straight masses of metal between the cylinder and the main shaft bearings so as to resist the heavy strains between these points. As all strains follow straight lines, it is evident that this principle of design most effectively resists them.

In the design of the "Brighton" engine this principle is carried out. The entire top portion of the bedplate or frame extending between the cylinder, which is bolted thereto, and the main bearings, consists of two heavy bodies of metal of massive strength, one on each side, extending in straight lines between bearings and cylinder.

The straight-line principle is also carried out in the crank and flywheel construction. In all explosive engines the pressures transmitted from piston to flywheels are violent and sudden, and the more directly these pressures can be transmitted to the flywheels and absorbed by them, the less iability will there be to breakage and



disarrangement of the engine parts. In the "Brighton" engine, the flywheels are therefore placed between the main bearings instead of outside of them. It is clearly evident that in this method of construction, energy is stored more directly in the flywheels than is the case in any other engines where the flywheels are outside of the bearings.

Many otherwise well designed and constructed gas engines have proven defective and their usefulness of short duration, ending in the breaking of some of their main parts, because of the light weight. Especially is this true in the designing of the bed or frame. The bed of the "Brighton" engine is not only strong and heavy but likewise massive. It alone weighs more than many makes of engines complete of equally rated power. It is not only ribbed throughout, but has, extending across it, webs and braces which make it absolutely rigid.

Under each main bearing is cast a large reservoir for oil, from which chains automatically travel around the shaft, thus flooding the main bearings; and afterward the

oil is collected and returned to the reservoirs to be used over again. By this method thorough lubrication is assured and without waste of oil. Gauge glasses show the height of oil in the reservoirs, which seldom need attention oftener than once in several months, and never suddenly.

Solid discs are cast in the center of the flywheel, and into these discs are hydraulically pressed, first, the crank-pin which firmly unites the wheels, and then the shafts pressed into the flywheel centers make the crank complete; all in the same manner and with the same success that the crank-pins and axles are pressed into locomotive driving wheell. It is apparent that this method of construction will form a solid structure, dividing the strain equally between the bearings, and as well give an opportunity to balance properly the reciprocating parts. The tremendous twisting strain on the crank-shaft is also thus avoided. This method also permits the use of a higher grade of steel than is practical in a forged or cast crank-shaft, owing to the difficulty encountered in machining it. With such hard steel as is used in these pins and shafts, it is impossible to produce perfectly true cylindrical surfaces in the lathe. The only practical way of accomplishing this is by grinding.

The connecting rod brasses press against the crank-pin the entire width between the two flywheel discs, so that the thrust of the connecting rod is absorbed at once by the heavy flywheels, thus relieving the main bearings of a good part of the thrust of the piston.

The crank-pin is oiled while the engine is in motion through a generous sized straight duct leading from a circular groove in the hub of one of the flywheels. The groove is fed by a stationary sight feed lubricator placed on one of the main bearing caps. Disappearance of the oil into this lubricator is evidence that the crank-pin is receiving oil. In addition to the oiling device mentioned, there is placed on the crank end of the connecting rod a grease cup which immediately floods the crank brasses and pin if for any reason they should heat. It is therefore almost impossible for any damage to result to the crank-pin or brasses of a "Brighton" engine from their becoming hot. The flywheels and shaft alone compose about one-half the total weight of the complete engine.

All cylinders and pistons are made of a special mixture of close-grained iron, and of peculiar hardness to insure long service without excessive wear. Both inner and outer walls of the cylinders are very heavy and joined by numerous small bodies of metal through the water jacket, the object being to retain the strength of both walls to resist the very high pressures within the cylinder. The water jacket surrounds the entire cylinder as well as cylinder-heads and has both inlet and outlet openings of ample size to keep the cylinder always as cool as is consistent to secure the highest economy and efficiency.

The pistons are designed with a system of heat conducting and radiating ribs placed internally, which permits the use of lighter weight pistons, with thinner walls than can ordinarily be used, and still produce a piston of ample strength. The object of these conducting and radiating ribs is to keep the temperature of the center of the piston from rising to a point that would result in premature ignition, as well as to strengthen the piston walls. All pistons are provided with three or more cast-iron rings, accurately fitted to grooves in the piston. The joints of these rings are cut diagonally, and are equally spaced around the circumference of the piston, and held in place by pins. This arrangement assures good compression.

The cylinder and piston are lubricated by a large sight-feed compression cup, placed on top of the cylinder. The piston having a number of oil-distributing grooves, results in a uniform distribution of oil over the working surfaces of cylinder and piston. A portion of this oil is carried by a duct through the walls of the piston to the piston pin bearing of the connecting rod. The piston pin is driven through the piston and firmly held in position by set screws fitted with lock nuts on each side of the connecting rod.

The connecting rod is made extra heavy and forged of the best open hearth steel. No cast steel or malleable iron connecting rods are ever used in the construction of the "Brighton" Engines. Both ends are fitted with phosphor bronze boxes and with strap joints with gib and key adjustment to taking up the wear. One of the most difficult

features of a gas engine to design and construct and one which has no doubt caused more failures among gas engine builders than any other, is the valve mechanism. In order to more clearly understand the design and operation of this mechanical feature, let us briefly consider what transpires in a gas engine during one complete cycle. Almost all gas engines are now built to operate upon what is known as the four-cycle principle, or a cycle of four half revolutions of the main shaft, during but one of which half revolutions the engine receives an impulse, the fly-wheels giving out the power during the other three half revolutions or three-quarters of the time. The engine is single-acting, and pushes the piston forward only; hence the great advantage of extra heavy fly-wheels as compared with those of a steam engine of equal power. When the piston begins this cycle of four half revolutions, its first operation as it moves forward is to draw in behind it into the outboard end of the engine cylinder, a mixture of something like nine parts of air and one part of gas, which of course varies in proportion according to the heat units contained in the gas used. The inlet valve closes when the piston reaches the forward or fly-wheel end of its stroke; the piston then, during the second half revolution, returns toward the outboard end of the cylinder. The valves being closed, the mixed air and gas cannot escape and the piston being impelled backward by the momentum of the fly-wheels, compresses the mixture into the clearance chamber in the outboard end of the cylinder. When the crank is crossing the center, and the piston is at the extreme end of the compression stroke, this mixture is ignited, and the valves entering the cylinder still remaining closed, the pressure immediately rises and the piston is impelled forward; the surplus power during this stroke is transmitted through the connecting rod and stored in the fly-wheels. It will thus be seen that it is during this half revolution that the fly-wheels receive a forward impulse; all the balance of the time they are giving out power to perform operations now being described. When the piston reaches the forward end of the stroke, the exhaust valve opens, and upon the return of the piston the burnt gases are expelled out of the cylinder.

Thus four half revolutions were performed: First, taking in gas and air; second, compressing them; third, igniting them; fourth, expelling spent gases. The engine mechanism is now ready to repeat the above outlined cycle of operations. As a valuable accessory to the above cycle of operations, but not affecting its routine, is placed in the forward end of the cylinder wall of the "Brighton" engine a vertical port, in such position that each time the piston is at the forward end of its stroke, and during the time the connecting rod is moving over its forward center, the port is uncovered by the piston. As this port opens directly into the exhaust pipe, at the end of the third half revolution, the bulk of the burnt gases, being still under quite a pressure and of high temperature, leaves the cylinder through this opening. The remaining burnt gases are now very much reduced in temperature owing to their rapid expansion, which is made possible only by the use of this auxiliary port. After the piston again starts backward on its fourth half revolution, these remaining burnt gases are expelled through the main poppet valve, and not the entire products of combustion, as is usually done in the operation of other engines. This method of clearing the cylinder of the bulk of the burnt gases and thus reducing the temperature of those remaining, as before described, overcomes the usual rapid wear and burning out of exhaust valves.

There are two methods of governing now generally adopted in gas engine construction, the "hit or miss" and "throttling." The former is perhaps the better known and more generally used, the principle being that the charge of gas and air admitted to the cylinder is the same amount for each impulse, whatever the load carried on the engine might be, the number of impulses, however, being varied to meet the requirements for power in proportion to the work to be done. The latter principle is to throttle the amount of the charge of gas and air admitted to the cylinder, the number of impulses, however, remaining constant. In both cases the relative proportions of gas and air remain the same under all conditions. It is now admitted by all that while both of the above principles have their good points, yet each one has its advantage over the other when used for particular purposes under certain conditions. The "Brighton" engines of sizes larger than six horse-power are equipped

with governors of either principle, as desired. Engines of six-horse-power and smaller are equipped with the "hit or miss" type of governor only.

The ignition of a charge in a gas engine cylinder is accomplished by either of the two methods commonly known as the incandescent tube and electric spark. Believing that both of these methods have advantages, and inasmuch as the matter of ignition is a very important one, the "Brighton" engine of sizes above six horse-power are equipped with igniters of both methods. Engines of six horse-power and smaller are equipped with the incandescent tube igniter only, on account of its simplicity and other commendable features. On engines equipped with both tube and electric igniter, they are so arranged that either may be used independently of the other, and a change made from one to the other while the engine is in operation. This feature is of considerable advantage and convenience, as in the event of either of the igniters becoming impaired, the other can be brought into use at once without even the stopping of the engine.

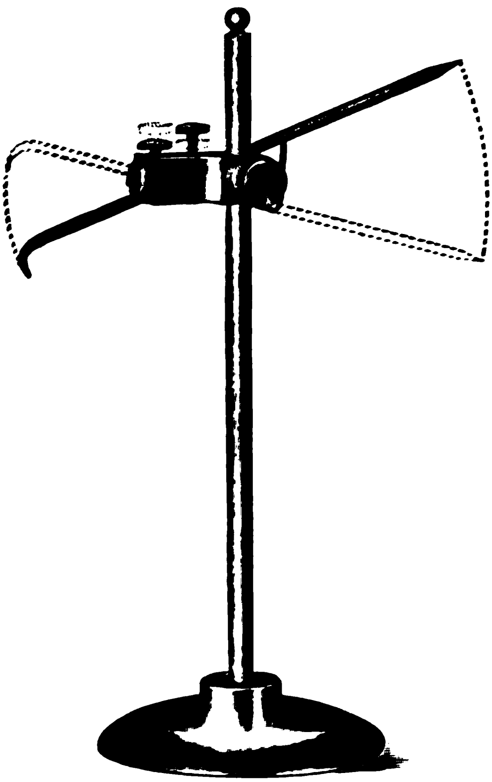
In the past one of the troublesome features of a gas engine was to start it. No doubt this one objectionable feature more than any other has been the cause of spreading prejudice against the use of gas engines. The common method employed, resulting likewise in common failure, is to tread the fly-wheels, this taking the assistance of several persons until sufficient momentum is secured to draw into the cylinder a charge of the explosive mixture, compress and ignite it. In this method the engine is liable to reverse quickly, and unless the persons starting it are careful are apt to lose limb or even life. Besides the danger this method is very troublesome and laborious. Another plan used by many is to explode a charge of blasting powder by means of a breech-block and firing-pin attachment inserted in the cylinder. This plan is likewise exceedingly dangerous, and not at all sure of producing the desired results. It also deposits in the cylinder, considerable sediment and grit, this is injurious to the cylinder piston and valves. Still another method frequently used is to operate a small air compressor by belt from the engine to fill several large air storage tanks, the air pressure alone being used to secure several revolutions of the engine before any ignition takes place. The objectionable features of this system are obvious, requiring as it does additional room, complicated and expensive equipment and additional source of power.

The operation of the automatic starting attachment used on the "Brighton" engine eliminates all of the undesirable features mentioned, and is so simple and yet so effective that one person can start engines of the largest sizes.

The attachment used, consists of a small storage tank for air, which is compressed by the engine itself, the cylinder being used as a compressor. A double check valve or starting valve is placed on the air line leading to the engine, the line also being provided with a sealing valve, and a pressure gauge is placed on the storage tank. The air tank when shipped with the engine is charged with air ready for the first start. After the tank is properly connected to the cylinder, a small quantity of gasoline, not over a spoonful, is poured into the small cup of the starting valve, and by opening a small cock this passes into the air line.

The engine fly-wheel first being turned over to the starting point, the position o- the crank-pin being off the dead centre, the engine is ready to start. A throw of the starting valve handle admits a small quantity of air to the cylinder, vaporizing the gasoline in the pipe, forming a combustible mixture which is ignited in the cylinder, thus giving a strong impulse to the piston. The piston on its next forward stroke draws in a charge of the regular supply of gas, which has already been turned on, and igniting the same, the engine then begins its regular cycle of operations. One starting of the engine reduces the pressure in the air tank only a few pounds; thus, on a full supply and pressure of air, an engine may be started several times. To refill the air tank it is only necessary to shut off the gas supply, open the sealing valve and raise the starting valve handle. The power stored in the heavy fly-wheels is sufficient to recharge the air tank to the desired pressure. With this attachment the largest engine may be started in less time than it takes to describe it. The "Brighton" gas engine is built by the Pierce-Crouch Engine Company, New Brighton, Pa.

IMPROVEMENTS IN MACHINISTS' TOOLS.



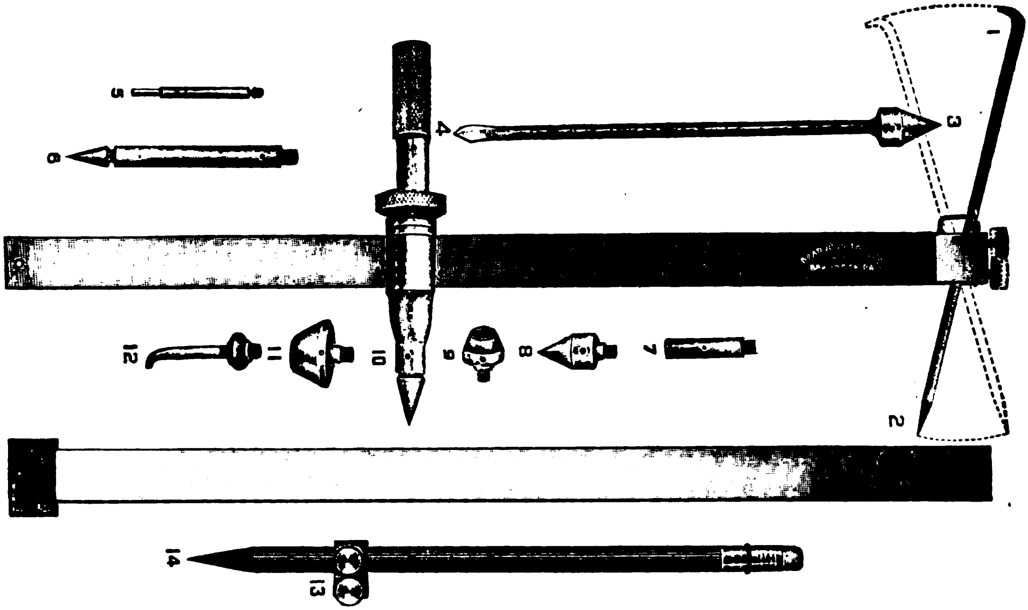
PITTSBURG has the reputation of being the greatest iron and steel center in the world but it is only recently that the manufacture of tools for the working of metals has been undertaken. It would seem natural that finished tools, large and small, could be manufactured cheaper near the supply of raw material, yet we have to send to New England for our tools used in mechanical measurements, etc., and our machine tools are largely made in Ohio and the New England states far from the supply of raw material, or rather from the center of its production. The Braddock Tool Company, Braddock, Pa., within trolley distance of Pittsburg, has undertaken the manufacture of machinists' tools that are making a reputation for the firm. All the small tools made by this concern are patented.

One of these tools is an improved surface gauge. The needle has a fine and quick adjustment enabling the most accurate setting, as will be seen from the illustration. No spring is necessary to prevent lost motion. When the needle is set it cannot possibly be moved, thus avoiding error caused by the accidental moving of the needle.

The improved adjustable center square is one of the indispensable tools which embodies many new features not provided hitherto in center squares. It has an adjustment at right angle to the center line of the angle, which makes it valuable in laying out hexagons and octagons. The center head may be adjusted to any position in the scale and clamped in that position. The back of center head is made accurately square to the center line, making the tool also valuable as a try square. It may also be used as a depth gauge. It is invaluable in laying out key-ways. By the construction of the clamp, when the tool is set, the head automatically sets accurately square with the scale.

The improved steel beam trammels

have a flat steel beam with a fine and quick adjustment in the one end. Experienced mechanics will appreciate the advantage of a flat beam. The adjustment in the end is a new feature of a great value, as it permits the accurate setting to any dimension which may be depended upon. It has a cutter for cutting cardboard, rubber, leather and other soft material. After the trammel is once set, if it is desired to change from one style of point to another, for instance from a male center to a cup center it may be acomplished without resetting, by unscrewing the one center and replacing it with another; thereby maintaining accurately the original dimensions.



After it is once set, the same dimensions may be preserved, and a lead pencil attached, thereby enabling the accurate circumscribing of the same circle on paper or wood. It is provided with long points, also extension for reaching greater depths. It has ½ inch male center, one large female center, and one cup center, enabling two males or one female and one cup center to be used at one time. In addition to above the same advantages apply to the hermaphrodite, outside and inside calipers.

This concern also makes a spherical edge finishing boring tool, the only one on the market.

British vs. American Workmen.

THE following extracts are from the annual report of Consul Boyle, of Liverpool:

The attitude of workmen generally, and particularly of trade-unionists, in regard to labor-saving machinery has been warmly discussed through the newspapers ever since the great strike of the engineers a couple of years ago. The charge is made that there is a general disposition on the part of British workingmen to obstruct as much as possible the use of labor-saving machinery, and to limit its outout when the employers add machinery to their plant; and also that in certain trades the rule is "one man, one machine." whereas in America one man will attend to two or three machines. It is furthermore charged that there is an increasing disposition on the part of British workingmen to shirk work, and to use all expedients to perform as little labor as possible during the hours for which they are paid. These charges are made with great particularity against trades-unionists. There is, it is to be noted, a growing tendency throughout the country to shorten the hours of labor, while as the same time there is an upward movement in wages. As a rule, trades-unionists

deny the charge of obstructing the use of labor-saving machinery and limiting the output and they report that employers are lacking in enterprise in not fitting up their factories with up-to-date plants. It is undoubtedly true, however, that, speaking generally and quite apart from the question of trade-unionism, English manufacturers find it almost impossible to get the same amount of product from machines as is obtained in America. There are two reasons that account for this independent of any agreement, express or implied, on the part of trades-unionists to limit the output. The first reason is that, as a rule, the British workman is not as adaptable as the American workman—he does not so readily get command of new appliances as the American workman; and the second is that it is not the custom of the country for an Englishman, whether mechanic, clerk, or laborer to work as hard as an American.

English trades-unionists who have recently visited the United States as delegates to labor conventions or in a representative capacity to make observations as a rule report that American mechanics and factory hands work too hard. An American manager of a match factory established over there with American machinery once told me that 400 people in a factory in America turned out more matches than 700 people over here with identically the same machinery—and incidentally it may be remarked that practically all the machinery used in the English match factories is American and has been so for many years. In some respects the English workman is more "independent" than the American workman—that is he will not endeavor to make himself so "handy" and will often refuse to do anything outside a certain line rigidly laid down by the custom of his craft generally and by his trade union in particular. American manuacturers who establish factories here find that although the English workman is thorough in what he does, he is not only slow in comparison with an American workman but will sometimes strike on the slightest provocation,—although it is observed that within the last two years the leading spirits among trades, unionists have taken a somewhat pronounced position against strikes except as a last extreme resort. In this connection it is worth noting that as a rule strikes in England are more stubborn than in America although it is the exception for violence to be used here. Although there is a greater division of labor in America yet oftentimes twice as many men are required in England to do a certain job as would be required in America as each man is very jealous lest a workman in another allied trade should do the smallest piece of work which the rules of his trade say should be done by him and him alone. For instance when the town hall of Liverpool was recently being remodeled in the interior there was a strike for several months owing to the fact that some cabinetmakers did some work which the joiners claimed should be done by themselves alone. Within the last few days, a strike was averted by arbitration at Laird's shipbuilding yard (where the "Alabama" was built) on the Mersey opposite Liverpool, the dispute being as to whether the engineers or the shipwrights should place an electric dynamo in position. And there is now a controversy, with threats of a strike, at a port just North of here, between carpenters and shipwrights, as to who, under trades-union rules, had the right to construct a pier.

A few weeks ago, some painters who were re-decorating the interior of a church in a midland town ceased work because women were employed to clean the droppings of paint on the pews, and the employers had to finish the job themselves. And quite recently in a seaside town, there was a strike of teamsters because their employer refused to discharge a driver who had made a journey to a neighboring town three hours quicker than they themselves had been accustomed to take. A Liverpool architect once told me that he had two large buildings on which there had not been a stroke of work done for over three months, for the reason that a strike had been declared because a plumber's apprentice had been caught by the union "delegate" making a joint which the union rules stated should be done by a journeyman I was informed by the architect that within the last ten years the cost of construction had increased 15 per cent—owing partly to increase of wages, but principally to the limitations as to a day's work. A cut-glass manufacturer residing in Liverpoo tells me that notwithstanding increased mechanical facilities, the output per man has decreased fully 25 per cent during the last dozen years. I could multiply instances of this condition of affair, which permeates all grades of working people here. Even

household servants are imbued with opposition to doing the slightest thing but what is strictly in line with their particular employment. It can readily be seen that the prevalence of this cast-iron, hard-and-fast custom adds enormously to the ultimate cost of labor, although the individual wages actually paid here are much lower than in America. Americans who have been inclined to come to England to establish factories have often been forced to abandon their intentions, because of the disadvantages they would be under by reason of the system above explained.

In addition to the slowness of the British workman as compared with the American, there is a widespread feeling among working peoples here that they owe it to themselves not to exceed a certain amount of labor: and here again the "independence" of the British workman shows itself, for he will often absolutely refuse to do any more than a certain "stint," even though he be threatened with dismissal in consequence. Many workmen deem it a duty to themselves and their fellow-workmen to make a job last as long as possible. Two justifications are given, one being that if a workman does more than a certain amount of work he is robbing a fellow-workman of a job—and the loyalty of English workingmen to each other, and their repugnance to do anything against a fellow-workman which might be considered "mean," are class characteristics. The other argument is that as the employer pays a wage no larger than he is obliged to do, the workman is justified in performing as little work as he can. There is no doubt that class distinctions here, and the fact that "once a workman, always a workman" is the rule (although there are many exception, some of them notable), are mainly responsible for the acknowledged indisposition of many British workmen to do their "level best" in the sense in which it is understood in America. Trades-unionism has an influence here far beyond what it has in America, and it is but just to say that there is greater need of trades unions in this country than in America. Undoubtedly, English trades unions have brought about great reforms in the condition of factories, as to the hours of labor, in regard to the empolyment of children, etc.; and there are indications that the alleged restrictive policy of trades unions, express or implied, is gradually being modified.

Texas Oil at the World's Fair.

FUEL oil from the wells of Texas will probably be used under the boilers of the big power plant of the Louisiana Purchase Exposition to be held in St. Louis in 1903. The Director of Works of the exposition is looking into the feasibility of using Texas oil instead of the soft coal, which supplies very nearly all the fuel for the big factories of St. Louis. If the expense of the fuel oil, either in first cost or in cost of transportation, is not prohibitive it will be used.

"Oil has vast advantages over soft coal as a fuel," says Mr. Taylor, Director of Works. "Its principal advantage for exposition uses, where cream white is the color of the buildings, is that it does away with the all-soiling sooty smoke which bituminous coal produces. It also eliminates the dust produced in handling soft coal and the ash from it. Oil can be transported into the grounds in a pipe line. This obviates the necessity for a railway switch into the grounds for handling ashes and coal. It does away with firemen, coal-passers and ash-handlers. It obviates the necessity of banking fires during the time when they are not in maximum demand The oil jet fire can be extinguished and raised to its maximum in an incredibly short time. I have received propositions from several large handlers of Texas oil looking to the use of that fuel. If they can make suitable arrangements for transporting the oil, the World's Fair at St. Louis in 1903 will be operated with Texas oil."

The power plant for the Louisiana Purchase Exposition is to be the largest on earth, with a capacity of upwards of 30,000 horse power. Electrical contractors from all parts of the United States are now in St. Louis gathering information regarding the plant. The big engines are to be located in the center of the Machinery Building as an exhibit, while the battery of boilers will be located where danger of fire to the exhibit buildings will be eliminated.

THE BAROMETER IN MINING.

BY F. Z. SCHELLENBERG. *

I advise the men responsible for safe conditions in the gaseous mines to consult the charts issued daily under telegraphic direction of the Weather Bureau at Washington, and sent regularly to all postmasters that want them. Following the map indications day by day on experience teach one the prognostics for his locality.

Thus the approach of low barometer area being anticipated, there will be no surprise that the coming event casts its shadow before by increase of gas exudation into the mine workings from the newly opened faces of the strata, hours before the local barometer gives a plain sign of lowering atmospheric pressure. Also, the persistence of high barometer makes tense the penning in of the gases in the solid strata and lurking places, so that a fall of the pressure—and it may be locally sudden with thunder storm and veering of the wind—may give extra gas so ready to come, quick release.

That the barometer in the mine is slower than the gas is what has brought it into general disrepute among coal miners; a mercury barometer, or a dry little fettered air barometer (the Aneroid) cannot be as subtle to show changes in the pressure of air as is the big open gas barometer which the mine itself is. Now, surely, being posted daily by the map with its pictured tracts of different densities as parts of the atmosphere moving across the entire continent will give to an earnest guardian of the mine intelligence to become more than merely fitfully weatherwise.

Here at 900 feet above the sea level the mercury column ranged in the year 1900 from a normal of 29.1 inches to extremes of 29.7 and 28.3 the difference between which is equal to 19. inches water gauge or 100 pounds pressure per square foot on all open surfaces. On the weather maps the readings of all points are marked there as of sea level and 32 degrees F., in order to correlate more simply.

The Weather Bureau is under the U. S. Department of Agriculture but probably its value thus far has been greatest to those on the coasts who are concerned in the safety of ships, next to river men and railroad men and last to farmers. As I suggest, it would benefit coal miners.

When Morse harnessed the new force electro-magnetism and invented his alphabetic code so that a telegraph could be of common use, it was regarded as of importance first for transmitting intelligence over the country about the weather, particularly the standing of the thermometer at distant points; its great commercial use was not seen. Of course the telegraph had to be brought home to some to tell them anything about it; for instance the wiseacre on the national pike who was gazing, with others in the village, at them stringing the first wire on the poles said:—"It may do for small packages, but for large bundles, never." It took 25 years longer to start the Weather Bureau, in 1870.

Now it may be in order for the mine foreman to prove his appreciation of such government socialism by taking others' observations and giving his own. He may invent the means of making practicable the sensitive re-action of his mine with the atmosphere, to tell earlier about the state of this as to pressure than does any present barometric devices. But I do not think of him playing with his gas—he may have too much of it, or too little—but rather think of him and the bright ones in the colony around him devising a pair of large stationary aneroids as instruments of precision. There is no telling what new way men of the coal mine may pioneer in their provisional efforts; they invented the railroads and the locomotive. An aneroid would read pressures close as water gauge does if its division of scale corresponding to inches of mercury column were 13.6 inches long. A semi-circle of scale the scope of three inches of mercury, and as delicate as water gauge, would be about 26 inches in diameter.

It has been suggested to have a large water of glycerine column barometer placed

* Read at the Central Mining Institnte of Western Institute, Pittsburg, Dec. 18, 1901.

in school houses. For it a metal tube running up from a cistern, in the cellar and having a glass part at top to be read from the stair landing, would be safe and cheap. It would move feet to the mercury's inches or tenths, and its head of column could be reflected on to a convenient scale within or without the building. Glycerine does not evaporate ordinarily and would give 26 feet height. The tubes for such liquids must not be small or capillarity will add to the height of column.

The whole subject of the weather is, of course, not easy in its problems with the ever varying factor of pressure, temperature, and humidity of the air, and also the direction and force of prevailing wind at the scattered points of observation on land. The faithful watchmen should have honor and encouragement from thoughtful men against the vacuous scribblers in ridicule to whom every forming science is both mystery and child's play.

We are coming to replace man's superstition's with knowledge of the natural laws even in reckoning with the elemental forces in the grand arena of our universe.

Process for Welding Copper and Steel or Iron.

FOR some time it has been the custom of providing sledges or hammers with copper faces, which being soft and yielding, do not injure the metal, upon which they are used. A new method of putting these faces on the hammer has recently been discovered by Joseph W., Robert W., and Charles H. Comley, of Braddock, who have assigned a one-twentieth interest in the patent obtained on the same to Patrick Thomas Cook, of Homestead.

It is essential that the iron or steel before welding the copper or brass should be thoroughly freed from scale or rust which may be done by any method in practice. The body portion of hammer or other tool to be united to the copper face being placed in a receptacle, such as a black-lead crucible, in which it may be subjected to the temperature in the fire or furnace, the body being properly covered to prevent the iron or steel from oxidizing. The receptacle or crucible is heated until the temperature of the iron or steel body is raised to nearly the melting-point of the copper. At the same time a sufficient quantity of copper is placed in a vessel or crucible in the fire or furnace and melted. While in the molten state the scum or impurities are gathered. The copper being melted and the hammer-body being now ready to be united, the two receptacles or crucibles are taken from the furnace and the hammer-body is quickly removed from its inclosure, and that part which is to be welded to the copper is immediately plunged into or immersed in the molten copper. A small portion of lead sufficient to cause the copper to solidify is dropped into the crucible, or the lead may first be melted and poured into the vessel containing the molten copper, usually about one-fourth of an ounce of lead to one pound of copper. By putting this quantity of lead into the vessel after the hammer is placed in the molten copper the volatilization of the lead frees any sulfurous-acid gas from the copper, and the copper is purified and solidified. Charcoal and sand or other heat-retaining medium may then be placed over the welded mass, so as open too sudden cooling and allow the molecules of the two metals to unite more firmly. Thus covered the welded copperfaced body is allowed to gradually cool. As soon as the copper is solidified and cooled to the desired temperature the welded compound body may be removed from the crucible and at once rolled or shaped into any form or may be stacked for further treatment.

In making a brass or bronze face weld an alloy is prepared, which may consist of two parts tin, one part zinc, one part lead, and from two to fourteen ounces of copper. The zinc, lead, and tin, melted and alloyed, are poured into the receptacle immediately after the hammer-body is placed in the molten copper, and the whole may then be covered up with charcoal and sand or other heat-retaining medium.

In preparing the body portion of the hammer for welding to the copper face, the part to which the copper is to be welded is niched or roughened, so as to provide an irregular surface which will give the molecules of the copper and steel a better opportunity to lock and unite similar to the welding of two pieces of iron at the black smith's forge.

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British Trades Union Methods Condemned.

METHODS of British Trades' unions are being condemned by manufacturers and one of our own consuls looks into the subject and reitereates what has been told repeatedly, namely; that the union has an unwritten but well practiced rule, of compelling each man to do as little work as possible under the impression that the is benefiting his fellow worker. It is not many years ago since this belief prevailed in the United States but it was never put into practice. It was openly discussed by labor leaders, but the influx of workingmen from abroad who had to make a living, and the encouragement given the best workers by advances in wage and position killed the theory.

The conservatism of the British is proverbial. This was probably brought about by the monoply Great Britain enjoyed in the manufacturing arts for a century or more. The British have been outstripped by the United States and Germany. Facts and figures are placed before the British trade unionists. and delegates have been sent abroad to view with their own eyes the result of American and German energy. Yet the labor leaders refuse to adopt systems they know are ruining their industries. They simply say that the American works too hard and the British manufacturer is to blame for lack of enterprise. The latter charge is true to a large extent. The British capitalists will learn that he cannot expect a maximum amount of labor from his employes until he can give each individual worker maximum pay for his labor. It is the crushing out of indivuality more than anything else that is dethroning Great Britain from its commercial supremacy.

Some years ago an effort was made to limit the production of the coal miner in the Pittsburg and competing districts by compelling each miner to quit work after digging and loading a certain amount of coal each day. The proposition never came to a head because the miners did not favor it. The most they would favor would be to make the working day one of eight hours. The peculiarity of the situation will be appreciated when it is known that 90 per cent of the delegates to the convention had at one time been subjects to Great Britain and some had not taken allegiance to the United States. These same men, if members of a labor organization in Great Britain, would have taken an opposite stand on the question.

Coke "Breeze" Might be Used for Fuel.

The gas and carbon, tar and benzol, ammonia and other by-products of the bee hive coke oven are not the only products wasted. Large quantities of coke dust known as "breeze" is thrown away. This has some value and one experimenter in the Connellsville region proposes converting this into briquettes and disposing of it as fuel. This product if successfully briquetted should make a fuel that would be almost entirely consumed as it would leave no clinkers and only small particles of ash, the ash proper which has burned from the coke during the coking operation being only a trace as the coal is not entirely consumed by the coking fire. In the by-product coke oven operation the ash which is produced is used in manufacturing glass, etc. Owing to the hurry and rush with which coke is being made in the Connnellsville region inventors get very little if any encouragement from the coke makers.

To Mine Their Own Coal.

THE United States Steel Corpoation has caused consternation in the big corporation alleged to have the exclusive franchise for operating coal mines along Pittsburg's railroads. The big steel corporation is preparing to operate its own mines and has opened offices in Pittsburg for that purpose. When the corporation was organized the Carnegie Steel Company, the American Steel & Wire, National Steel Company and American Sheet and American Tin Plate and Hoop companies all owned extensive coal lands in the Pittsburg district which in the whole amounts to something like 50,000 acres.

The United States Steel Corporation uses from 3,000,000 to 4,000,000 tons of coal annually. Most of this has been shipped from the Pittsburg district. Since the consolidations were effected these combinations have enjoyed a lower price per ton for fuel than their competitors. But it has been ascertained that a greater saving can. be made by the operation of its own coal mines.

This knowledge probably led to some dissatisfaction among the directors of the big coal corporation as those retiring must have known that one of their best customers was preparing to mine its own coal. The independent steel manufacturers of the Pittsburg district have not been idle. They have been buying coal lands and organizing independent companies and many new mines are being opened with excellent railroad facilities. Others are looking for similar investments.

Britain's Monopoly at an End.

IT is only when statistics are looked into that we can realize why the British manufacturers and merchants are sad. C. J. F. Monoghan, U. S. consul at Chemnitz, Germany, in one of his reports has selected a few statistics on the exports of machinery of the leading nations and its growth in the past decade. Great Britain leads in exports with an increase of $18.492,100 in the past ten years, the figures for 1900 being a total of $95,383,400; The United States follows with a gain of $52,100,000 and a total of $71,600,000; Germany shows a gain of $38,389,400 and a total of $54,454,-400. It is the leaps and bounds made by the United States that has caused alarm in Europe as it is onlv within the last three years that the exports to Europe have grown into the proportions noted. If the ratio of increase continues the United States will outstrip Great Britain in exports in 1902.

First Class Working Arrangements Pay.

The day for slip shod, cheap and unstable erection is past. Stability is now being written over almost every new structure out of which investors hope to make money. It used to be that proverty compelled manufacturers to adopt second-hand machinery and apparatus in the hope of some time being able to adopt better machinery. But the times have changed and it is onlv the moneyed interests that can enter profitably into competition with the concerns that have gone through the trying stages of experiment, reconstruction and landed in affluence.

Two illustrations of this is the opening of a river coal mine on the Monongahela river by the Clyde Coal Company is shown elsewhere. This company while installing apparatus to operate a coal mine has evidenttly left nothing undone to save expenses in operation, yet the first cost is probably far greater than it would have been had the mine been opened as most of the mines of the Pittsburg district have been. The operators will find true economv in operating their property in this manner. It might also be noted that the many new manufacturing plants finding life are also being equipped far better than the old concerns with which they have to compete which will eventually place the older concerns at a disadvantage.

IN AND ABOUT PITTSBURG.

The Carnegie Steel Company has about completed plans for remodeling and enlarging the armor plate department of the Homestead steel works. Its capacity will be doubled in accordance with the request of the war department that the output of armor plate be increased. The machine shop adjoining the casting and forging department will be moved to make room. All of the lathes, drill presses, boring machines, devices for testing tensile strength, power plants, etc., will be carried 300 feet toward Homestead on a plot occupied by the pattern and carpentry departments now. The plot thus vacated is on the long side of the present rectangular armor plate department, so that the change will make it practically square. The big press in the plant, which has a capacity of 12,000,000 pounds, will be duplicated by another exactly like it in power, the two making the greatest pair in the world. Work is to be started shortly, or as soon as the details of the plans are prepared. The American Bridge Company will receive the contract for the structural work.

The Steel Car Forge Company, of Ellwood City, Pa., with offices in the Bank of Commerce building, this city, has been operating its plant in full throughout the year and reports an encouraging outlook for a continuance of strong demand for its products. Improvements contemplated include a 30-foot extension to its machine shop. The company recently added to its equipment a Bliss hot trimming press, a No. 6 Hilles and Jones punch and shear, a No. 1 Williams and White punch and shear, a five foot radial drill manufactured by the American Tool Works Company, a 1,500 pound Chambersburg drop hammer, and power chain hammer of its own construction. The officers of the company are H. R. Rea, president and treasurer, and J. A. Fraser, secretary and general manager.

Emil Swenssen, member of the Society of Civil Engineers and former manager of the Keystone bridge works of the American Bridge Company, has located an office at 600 Lewis block, this city, as civil and consulting engineer. Mr. Swenssen was with the Keystone bridge works for 14 years, starting in as draughtsman, then engineer in charge of the draughting department, then superintendent of the Keystone bridge works. Upon the acquisition of the works by the American Bridge Company he was made chief engineer and manager of the works.

The Rochester and Pittsburg Coal & Iron Company intends building a blast furnace plant at Bois in the near future. Plans are being prepared for a stack 80 feet high with 19-foot bosh; four stoves; casting house, engine house, ore trestles, etc. The boiler plant will consist of 2,000 horse-power. There will also be a re-rolling rail mill with machine shops and boiler works. Work of clearing the ground on which the proposed plants will be erected will be begun within a short time.

The C. Trautman Company, South Side, has secured contracts to furnish all the anthracite coal operators in Pennsylvania with mine accident cases. The last State legislature passed a law requiring all operators to possess such remedies as are required in case of an accident about a mine. This new case which the Trautman company is handling consists of a full outfit of blankets, both wool and rubber, bandages, slings, splints, torniquet and other appliances together with carron oil in case of burns. The case carries with it a complete set of directions. It is water proof to prevent dampness when placed in the mines. The order was secured in the face of strong competition owing to the completeness and practicability of the case.

The McFeely-Wheeler Brick Company, of this city, which has just started operations in its new plant at Latrobe for the manufacture of high grade silica brick, has closed a contract for all the fire and silica brick to be used in the construction of the new tank furnace for the C. L. Flaccus Glass Company, Tarentum. The McFeely-Wheeler company intends to make a specialty of shapes for the glass trade.

The G. L. Bollinger Company, Pittsburg, structural iron works, has closed for three acres of land in this city, which it will occupy as soon as improvements are completed. The company has been crowded for room and upon removing will gain an increased capacity of 100 per cent. The company reports, among recent orders, the contract to displace the wood work in the plant of the Pennsylvania Lubricating Company, this city, with structural steel.

The Department of Public Works, Pittsburg, will receive bids until January 21 for the furnishing and erecting of two compound condensing high-duty pumping engines for the Brilliant pumping station, and one triple compound condensing high-duty pumping engine for the Herron Hill station. An air hoist will soon be purchased for the machine shop of the Brilliant station.

Dilworth, Porter & Company have awarded the contract for the rebuilding on a permanent

scale of its Southside plant that was destroyed by fire some months ago. The McClintic-Marshall Construction Company has the contract for this work. The same construction company has the contract for the building of the steel viaduct at Trafford park, near Stewart station, for the Westinghouse company. This viaduct will be 1,010 feet long. It will cross Turtle creek and the Pennsylvania railroad tracks.

The Pennsylvania Railroad Company has bought an entire block in the heart of Altoona adjoining the present shop yards and will build a car wheel foundry to cover two acres and cost $1,000,000. The latest electrical cranes and improved machinery will be installed, It will require a year to build and work will be started as soon as the city councils grant the right to close the street adjoining the site.

The Brown & Zortman Machinery Company, this city, will increase the size of its show-room, Wood and Water streets, April 1. In addition to a full line of machine tools, the company has added a line of pulleys, hangers, belting, etc., to its stock and is prepared to furnish complete shop equipment. The company has located a warehouse on Second avenue, this city.

W. Lucius, designing engineer, Iron Exchange building, this city, has plans for a 600 foot, two-span cantilever bridge for the Ohio River Bridge & Ferry Company, Marietta, O. Mr. Lucius is also designing four new shops for the L. S. & M. S. Railroad Company, to be built at Collinwood, O., adjoining the shops being erected for the company. Contracts will be let within six weeks.

Application will be made January 6 for papers of incorporation for the James G. Cochran Company which has been organized by Messrs. James G. Cochran, William C. O'Reilly, Martin M. Shaw, and others. The company will carry on a general construction and contracting business in bridges, buildings, etc.

The Pittsburg Friction Draught Gear Company has been chartered at Harrisburg with the nominal capital of $1,000. The directors are William M. Orr, William D. Rowan, Boyd S. Leipart, William A. Harbison, Allegheny, and William H. Woodcock, Canton, O. The company will manufacture a coupler for railroad cars.

The Fort Pitt Analytical Laboratory has been opened at 207. Smith building, this city, by J. C. McTaggart. formerly with the Pittsburg Testing Laboratory. Iron, steel, brass, and Babbitt analysis will be made a specialty.

The Buffalo Forge Company has received, through its Pittsburg representative, the contract for the forge shop equipment of the British Westinghouse Electric Company. The works will employ 25 down-draft forges, besides the blowers and exhaust fans.

Work on the new tin plate plant which will be erected in Port Vew by the McKeesport Manufacturing Company, will be started within a few weeks. The work of construction will be under the supervision of Edward Crawford, of Duquesne, formerly an official at the Demmler tin plate mills.

The Saltsburg Glass Works, at Saltsburg have been closed for several weeks pending a change in the affairs of the company. It is said the citizens of Coshocton, O., have offered a bonus of several acres of ground if the plant be moved there.

The Reese-Hammond Fire Brick Company, Bolivar, is laying two miles of new tramroad in West Wheatfield township in order to open up new clay mines and sandstone quarries. The raw material will be run directly to their brick plant.

J. D. Lyon & Company, merchant engineers, Fitzsimmons building, this city, report the sale of a 60 horse power.; Merdes duplex gas engine to C. K. Hill for his electrical plant, Liberty avenue and Seventh street, this city.

Late last week it was discovered that the fly wheel on the engine at the blooming mill at the Edgar Thomson plant of the Carnegie Steel Company was badly cracked. The mill will be idle for a couple of week.

The Babcock & Wilcox Company, through its Pittsburg offices, has about completed the installation of 5,000 horse power Babcock & Wilcox boilers and stokers in the Shenango works of the National Steel Company, at New Castle.

The plant of the Duquesne Coal & Coke Company, at Bradenville, has been closed for several months, so that a new tipple and new haulage way can be constructed.

Bids are being taken for the equipment of the new plant of the Fort Pitt Malleable & Grey Iron Casting Company, at McKee's Rocks.

The A. F. Smith Company, New Brighton, contemplates the building of a 500 ton blast furnace to make foundry pig iron.

The Peerless Metal Manufacturing Company has removed its offices from the Bank for Savings building, to 1010, Park building.

An order in the Toronto council has been passed by the Ontario government incorporating the Algoma Tube Works, limited. This is the largest company ever organized in Ontario It is one of the F. H. Clergue enterprises. The new works will manufacture metallic tubes on the Perrin patent. The plant will be located at Sault Sainte Marie.

NOTES OF THE INDUSTRIES.

The York Haven Water & Power Company, now engaged in developing a water power on the Susquehanna river, below Harrisburg, is building the stone penstocks, retaining walls, etc., from plans made by the Robert Poole & Son Company, of Woodberry station, near Baltimore, Md. This masonry will require about 1,600,000 cubic feet of stonework, and will provide emplacement of forty turbine water wheels. These latter will operate 20 electric generators, of 750 kilowatts each, generating a current of 2,400 volts, which will be transformed to 24,000 volts for transmission to the towns and cities within a radius of 15 miles. The order for the turbines and the transmission machinery for this power station has already been placed with the Robert Poole & Son Company, and it is expected that the plant will be in operation in the latter part of 1902.

Officials of the Republic Iron & Steel Company and those of the American Steel Hoop Company held a conference with President Theodore J. Shaffer, of the Amalgamated Association of Iron, Steel & Tin Workers, regarding a construction to be placed upon a certain clause in the finishing scale of wages of the Amalgamated Association. An agreement was amicably reached regarding the point at issue, which affected 5 per cent of the wages of certain finishers. The amount was restored by the conference.

Two of the blast furnaces in the Shenango valley will change ownership this week. They are the Alice furnace and the Spearman furnaces located at Sharpsville. The former, owned by Pickands, Mather & Company, of Cleveland, will be turned over to the Youngstown Iron, Sheet & Tube Company, and the latter plant to the Oliver-Snyder Steel Company, of Pittsburg, by the Spearman Furnace Company. It is reported that the Alice plant was sold for $250,000 and the Spearman for $350,000.

The statement that the Youngstown Iron & Tube Company, Youngstown, O., would tear down Alice furnace at Sharpsville, Pa., which it recently bought, and build a larger furnace, is incorrect. The company bought Alice stack to supply the present wants and will begin the erection of a new blast furnace at Hazelton, where the works are located, in the early spring.

Messrs. Browne & Frothingham, 32 Broadway, New York, announce that they have opened a department for the export of machine tools, under the supervision of A. M. Fisher who has just returned to New York after three years spent in Japan where his attention was devoted to this branch of engineering.

Wilkoff Brothers, Youngstown, O., scrap iron dealers, are casting about for a location of a large mill. The plant will be located probably in Youngstown or in East Akron. The company will be capitalized at $200,000.

The large factory of the G. S. Graham Machine Company, Rochester, N. Y. was totally destroyed by fire. The loss is estimated at about $100,000.

The blast furnace of the Pacific Steel Company, at Irondale, Wash., was blown in December 14 and has been running smoothly ever since, making good grades of iron.

It is understood that the Baltimore & Ohio Railroad Company contemplates the erection of a large machine shop at New Martinsville, W. Va.

The Reading Coal & Iron Company's coal chutes at Cressona, Pa., were destroyed by fire a few days since, the loss amounting to $5,000.

The Mann Edge Tool Company will erect a factory at Lewistown, Pa., which will more than double the present capacity of the works.

The Robinson Brothers Company, of Akron, O., has leased the Lock Haven, Pa., clay works, and will operate it to its full capacity.

Henry Disston's Sons, Philadelphia, will build a one-story brick and steel shop, 90 by 150 feet to cost $15,000.

A $5,000 brick and steel machine and erecting shop is being erected for the Harrison Safety Boiler Works, Philadelphia.

For the purpose of engaging in the manufacture of automobiles the Light Cycle Company, of Pottstown, Pa. will increase its capital.

A blast furnace of the E. & G. Brooke Iron Company, Birdsboro, Pa., idle two years, will be put in operation soon.

The Aurora furnace, at Wrightsville, Pa., has been banked as the supply of coke is exhausted.

IRON AND STEEL TRADE,

PRICES AND CONDITIONS.

PITTSBURG—The famine in motive power, not absolutely of course, but as compared to the iron and steel, coal and coke tonnage to be moved in the Pittsburg district, is the burden of the manufacturers. It is perhaps, just as well that the railroad managements are inaccessible as a body to the body of iron, steel, coal and coke producers of this region, for the collision would be something terrific. The iron and steel men are goaded into a fury that seems justifiable in the light of all the information that relates as well to the primary stages of the existing congestion as to the latter form.

While the railroads have been making much display about getting into New York and other sea-board points they have shamefully neglected the gold mine right at their doors. There is no need for expensive tunnelings as at New York and other points and the display of needless energy at that and other places is not at all attractive to the crippled iron and steel producers of the greatest industrial center of the world.

The anger of the iron and steel men might be somewhat less were it not for the fact that the very condition confronting both railroads and the industries named was foretold to the railroad managers by the iron and steel manufacturers long ago. The transportation manipulators were urged as forcibly as possible to get ready to meet the expanding business but they always had plenty of reasons for discrediting the pleas of the producers. Now that the condition has been thrust upon them there are all sorts of excuses why their equipment is insufficient to meet the barest necessities of the iron and steel men. In fact there is not one legitimate reason why the railroads should not have been able to handle promptly all the business that is now held back completely because the transportation facilities are inadequate. It is this plain open and shut fact which does not admit of either excuses or reasons why, that is the cause of the just anger of the iron, steel, coal and coke men.

Today there are 15 blast furnaces in and about Pittsburg and the valleys banked for want of coke. The furnace men can get no coke to the furnaces nor iron away from their stacks. Material, as a consqeuence, is relatively scarce and of course has a slightly higher use value. Some 10,000 tons of Bessemer were sold this week for $16, at furnace, which is to be the rate for the first quarter of 1902. Forge iron is also slightly higher, sales this week running at $15.75, Pittsburg, which is 25 cents per ton higher than a week ago. Billets are in better supply and may be described as easy with no indication of a break from the ruling high level of $27.50 and $28 per ton.

In the finished lines there is nothing new to report. The mills are all supplied with sufficient tonnage for several months of hard work but the big plants have thousands and thousands of finished material stored in yards and every available place waiting for transportation. At the larger plants, as the Carnegie Company, and Jones & Laughlins, the car supply is probably better than at the smaller plants but even there the supply is far below the requirements. The mills are able to operate only a portion of the time for want of room to store unshipped finished products.

The American Steel Hoop Company has issued a new list on cotton ties the first for the season's crop of cotton. The new list is for delivery prior to April 1, which means for the first quarter of the year only. The new list is as follows:

Lots of 10,000 bundles and over, 80 cents per bundle; less than 10,000 but more than 2,000 bundles, 83 cents; lots of 2,000 bundles and less, 86 cents per bundle. All at mill, Pittsburg, with full freight added to points of delivery. On this list there is a premium of ½ cent per month for delivery as to precedence. This rate is a reduction of about 20 cents per bundle on the prices produced by the strike and since held as current.

CURRENT QUOTATIONS:

Basic	$16 25	16 50	Splice bars	1 50	
Bessemer	16 50	16 75	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		16 50	Z beams	1 60	
Fdy 2, Nhn		16 25	Channels	1 60	
Fdy 3, Nhn		15 50	Boiler plates	1 75	
Mill Iron	15 25	15 50	Fire-box	1 85	
Fdy 1, Shn	16 40		Sheared	1 65	1 75
Fdy 2, Shn	15 90		Tank	1 69	1 70
Fdy 3, Shn	15 15	15 40	Steel melt'g scrap	14 00	
Grey Forge, Shn	14 65		No. 1 wrought	15 50	
Bessemer billets	27 50	28 00	No. 1 cast	13 00	13 25
Open hearth	29 00	30 00	Iron rails	21 50	
Steel bars	1 60		Car wheels	17 50	18 00
Iron bars, refined	1 75	1 90	Cast borings	6 00	7 00
Light rails	34 00	37 00	Turnings	10 00	
Bolts, iron, sq nut	2 50		Sheets, 26	3 00	
Hex nuts	2 65		Sheets, 27	3 10	
Standard sections	28 00		Sheets, 28	3 20	
Spikes	2 00				

PHILADELPHIA—A very gratifying feature of the iron and steel markets this week is the large number of supplementary orders from consumers who are supposed to have covered their wants well into the coming year. Some who

had expected to delay purchases until next month are forced into the market by their actual wants for immediate use. Many of these large consumers are using material more rapidly than they had expected when they placed long-time orders months ago. Ordinarily trade is dull at this season of the year, with consumers directing their efforts to as much of a reduction of their stock of pig iron and other materials as can be had, consistent with the maintenance of operations on the sale called for by their buisness.

Furnaces in this and adjacent territory are so closely sold up that there is practically no pig iron for sale for early shipment. Everything appears to have been taken, and, more than that, a great deal of iron due for delivery this month cannot be got out, simply because the furnaces are oversold. Contracts placed during the week were mostly for shipment during February and March, and the second quarter of 1902. The general impression is that the quotations for the standard brands of Northern iron, tidewater delivery, are likely to continue in force for the early months of next year.

The scarcity of steel billets is not less stringent than it has been for months past. Prices are anywhere from $29 to $30 for prompt shipments, but considerably less for deliveries covering three to six months of the coming year.

In finished iron and steel products there is less buoyancy than in pig iron and other primary materials. There is no general scarcity, but here and there a mill making bars or a plate mill is scouting around for orders, and in almost all lines pretty fair deliveries are promised after the turn of the year. In some localities reports are more favorable, but it is tolerably clear that the pressure for deliveries is less urgent than it was some time ago. Structural material and thin sheets are extremely scarce, however, and it will probably be a considerable time before there is much relief particularly as regards structural material. It is stated that the American Bridge Company has on its books for making upward of 400,000 tons of bridge and structural work.

The steel rail order from Mexico, which it is said will amount to about 150,000 tons, has not been placed. It is expected that several lots will be placed at an early date.

CURRENT QUOTATIONS:

Foundry, 1	$16 25	16 50
Foundry, 2	15 75	16 25
Gray Forge	14 50	14 75
Bessemer billets	29 00	30 00
Open h'rth bil'ts	30 00	31 00
Steel bars	1 70	1 80
Refined iron bars	1 65	1 75
Standard rails	28 00	

Girder rails	32 00	32 50
Angles, 3" & lr'gr	1 75	1 80
Under 3-inch	1 85	1 90
T's 3" and larger	1 80	1 85
Under 3-inch	1 85	1 90
Heavy plates	1 75	1 80
Beams and chanls	1 75	1 85

NEW YORK—The last week of the year witnesses a state of confusion in the iron trade that absolutely unprecedented. With iron going into legitimate consumption at a rate exceeding any records, and a consequent strain on the full capacity of the country, a break-down comes in an unexpected quarter. The railroads have not rolling stock to handle the traffic offered. They are unable to get the coke to blast furnaces, and the finished product is piling up at Pittsburg and other mills to an extent that means distress to a thousand construction enterprises throughout the country.

From latest information, more blast furnaces are closed than are operating in the Central West. In Virginia a number of plants are shut down and more are expected daily to have to quit. In Alabama the situation is a little better, but coal mines, coke ovens, iron mines and furnaces are all greatly embarrassed. In Chicago and the Northwest about half of the furnaces are idle. Latest report from the Mahoning and Shenango valleys is that practically all furnaces are stopped.

The railroads hold out little hope of early relief. The largest system practically throws up its hands. It has miles of loaded cars at each important center which it is unable to move. The Connellsville coke ovens requiring about two thousand cars per day for loading, are getting less than one-third their needs. Over 200,000 tons of coke are piled at the ovens. This experience is repeated at most industrial centers in the central West and South. The worst trouble at the moment is the lack of motive power.

Manufacturers are bitter in their complaints of narrow sighted railroad management, which in the years preceding the revival, made no provision for what was known to be ahead.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$16 15	16 40
No. 2X fdy Jersey City	15 65	16 15
No. 2 plain Jer. C.	15 15	15 65
Sohn. 1 fdy N. Y.	16 25	16 50
No. 2 fdy N. Y.	15 50	16 00
No. 3 fdy N. Y.	14 75	15 50
No. 1 soft	16 00	16 25
No. 2 soft	15 25	15 50
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40
Sheets, blue annealed, 10	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00
Plates ¼ and heav	3 15	
Ship & tank plate, on dock	2 50	2 50
Sheets, galvan. ex store N. Y. 70 & 5 to 70 & 10		
Beams and chan'ls 15-in & under	2 00	2 50

Angles	2 00	2 50
Tees	2 00	2 50
Zees	2 00	2 50
Time deliveries, basis $1.75 for angles, beams and channels.		
Com. base, bars per 100 lbs.	1 85	1 90
Refined base, bars	1 90	2 00
Bands, base	2 40	2 50
Norway bars	3 75	
Norway shapes	4 25	
Old T rails, iron f. o. b. cars	19 00	20 00
T rails steel f o b c	16 00	17 00
No. 1 wro't scrap iron f o b cars	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes	13 00	14 00
Old car wheels, f. o. b. cars	16 00	17 00
Old ham. car axl's f. o. b. cars	22 00	23 00
Wrought turnings deliv. at mill	9 00	10 00

CINCINNATI—During the week sales aggregating about 15,000 tons were made for delivery during the first half of this year. Sales are little sought after, the greatest desire is for shipment

of sales already made, for probably iron is harder to get today than ever before, the furnaces being all sold up close, and most of them way into the future. Prices are on a low basis everything considered, and many are talking about advanced prices, but as yet they have not gone upward. Prices are firm, and prospects of the iron trade are good, and there will be many deals go through in the first part of the new year. The foundry men are still laboring under great disadvantages. Shortage of iron, and coke, cars, and locomotives make great inconvenience.

The business of the pipe foundries of the country is said to be better than it has been in years., and the Addyston branch of the United States Cast Iron Pipe & Foundry Company is so well supplied with business that the branch can promise delivery on special stuff no earlier than May. An order for a lot of castings was offered to the company this week by a concern that is in need of some special work, but the order could not be filled by the company unless delivery as long as five months hence could be agreed to.

CURRENT QUOTATIONS:

Sohn. fdy. 1	14 75	$15 00	Steel hoops	1 96	2 50
Sohn. fdy. 2	14 25	14 50	Sheet, 26	8 50	
Sohn. fdy. 3	13 75	14 00	Sheets, 27	3 35	3 85
Sohn. fdy. 4	13 25	13 50	Sheets, 28	3 45	3 95
Grey forge	13 00	13 50	Angles, 3 to 6 in	1 75	2 50
Mottled	13 00	13 25	Angles, 1¼ to 2⅝	1 75	2 50
Shn. 1, soft	14 75	15 00	Beams and Chanls		
Shn. 2, soft	14 25	14 50	15 in and under	1 75	2 70
L. Superior, fdy. 1	15 25	15 50	I b'ms 18, 20 24 in	1 80	1 50
L. Superior, 2	14 75	15 00	Tees	1 75	1 85
L. Sup'r char'l c w	19 00	19 50	Z's	1 70	1 80
Hang'g r'k ccl, 1	20 00	20 50	1 wrought scrap	12 00	13 05
Sohn ccl c w	17 25	17 50	Steel mlting stock		
Jakm cy. silv'y 1	15 50	15 75	gross ton	11 50	
St'l brs base hlf ex	1 65	1 90	No. 1 cast	11 00	
Iron bars	1 65	1 90	Old iron rails g t'n	15 00	
Flange plates	1 82	1 92	Old car wheels	14 50	
Tank steel	1 72	1 82	Cast borings	5 00	
Ordinary fire-box	1 92	1 97	Turnings	5 50	
T rails	36 00				

CHICAGO—Southern pig irons have advanced 50 cents. They had been below the level of local irons and the extreme scarcity of the latter, because of the coke famine, gave to the Southern producers a very large demand for spot metal. The coke situation can scarcely be said to have improved and both furnacemen and foundrymen are buying fuel from all possible sources, the aggregate continuing inadequate, with the result that both the production and the consumption of pig iron are seriously impaired. There is a fair inquiry for the first half of the new year and some few inquiries of goodly size are for shipments beginning next May or June. Prices of Northern irons are nominally unchanged, but for quick shipment none are to be had, makers being far behind in deliveries.

There is continued strength in finished product. The holidays have created a new record in the matter of activity. The inquiry is widepervading, affecting all kinds of manufactured iron and steel, except pipe and wire products, which are inactive, by reason of reported weakness of prices. Demand for rails continues large, both light and standard sections being called for in goodly quantities for next season's deliveries. Scrap is only moderately active. Mill owners are taking small lots offered at the same prices lately bid but offerings are not large, deals not being reconciled to the quotations bid. Cast scrap is increasng in interest bv virtue of the scarcity of pig iron.

CURRENT QUOTATIONS:

Bessemer	17 50	18 00	Sheets, 26 store	3 15	3 25
Fdry Nohn 1	16 00	16 25	No. 27	3 25	3 35
Northern 2	15 50	15 75	No. 28	3 35	3 45
Northern 3	15 00	15 25	Angles	1 75	
Southern 1	16 15	16 40	Beams	1 75	
Southern 2	15 65	15 90	Tees	1 80	
Southern 3	15 15	15 40	Zees	1 75	
Forge	14 65	14 90	Channels	1 75	
Charcoal	18 50	19 00	Steel melt'g scrap	13 50	14 00
Billets, Bessemer	30 00	32 00	No. 1 wrought	15 00	15 50
Bars, iron	1 65	1 70	No. 1 cast, net ton	12 00	12 50
Bars, steel	1 65	1 70	Iron rails	20 50	21 50
Rails, standard	28 00		Car wheels	15 50	16 50
Rails, light	31 00	34 00	Cast borings	5 00	5 50
Plates, boiler	1 90	2 00	Turnings	9 50	10 00
Tank	1 75	1 80			

BIRMINGHAM—The Southern iron field enters the new year with the blast furnaces booked to their utmost capacity to April 1, and with a rising market. Some makers have again advanced No. 2 and are holding it at $12 per ton, but no general advance at that figure has yet been made. The market is on a basis of $11.75 for No. 2. Quotations will be changed in all probability in compliance with the actual advance this week. It is difficult to obtain spot iron. All the industries, which closed down for the holidays or on account of the cold spell, resumed Monday last and there is not an idle plant anywhere.

A review of the year shows that the output in all departments has been heavier than ever before and that shipments to domestic points have broken all records. Export shipments make a poor showing. The domestic market continued so brisk during the entire year that the export trade fell back to almost nothing. The prospects for an export business in 1092 are not any better. The year commences with a falling continental market and no export orders booked by Southern makers. Stocks of all kinds are extremely small.

The rolling mills and foundries share the general prosperity. The car famine is again rearing its head and coal is at a premium on account of the difficulty experienced in moving it. Rush orders are coming in from several directions owing to a general scarcity. A number of industries built during the past year will shortly go into operation, varying the manufacture of metals in the South in several departments of finished output. The year starts under the most flattering auspices in every sense.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$11 50	12 00	Tank	1 80	
No. 2 fdy, Sohn	11 50		Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	10 75	11 00	No. 1 wrought	14 00	
Grey forge, Sohn	10 00	10 25	No. 1 cast	12 00	
Billets	24 00	25 00	Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	3 10	3 50
Fire box	2 00				

Coal.

PITTSBURG—The inability of the coal companies to get coal to their customers is the feature of the market. Many of the chief consumers of coal are unable to get fuel and in those cases where the coal shippers get the product on the way the railroad companies simply confiscate what they need leaving the consumers in the lurch.

CHICAGO—Strength of a decided character lingers in the Western coal markets. Illinois and Indiana products are from fifty cents to a dollar above the prices of three weeks ago, though not so high as the famine prices just before Christmas. The miners are not working well during the holiday season and the demand considerably exceeds the supply. It comes from all sources, railroads, manufacturers and dealers. There is no improvment in the receipts of Eastern coals, and buyers on old contracts have to find substitute fuels quite commonly. Nor is any promise of early improvement in transportation held out by the carriers. It looks like a continued strong market for some time to come. Dock interests will continue during January the same scale of prices at all upper lake ports that prevailed during December. This is conservative action in view of the scant stocks of the dock owners. Coke is very scarce and spot deliveries command premiums.

Coke.

The Christmas holiday and the inability of the railroads to move the coke had a depressing effect upon the coke trade last week. All the coke plants in the region were off on Christmas and most of the ovens remained idle the day following in order to load stock and relieve the congested condition of the yards. The car supply was some better than the week previous and considerable coke was lifted from the yards Thursday, but the relief was of short duration. Friday and Saturday the car supply was 1,000 to 1,500 short of requirements and almost all the gain of Wednesday and Thursday's lay-off was lost.

A number of plants did not have any cars at all Friday and the day's product took the place of that lifted Thursday. The report of the week's shipment shows a gain of over 26,000 tons but owing to the two days' suspension production was nearly 60,000 tons less than the week previous. The indications point to a shortage of at least 2,000 cars this week, and many of the coke plants will be restricted to a five days' run. The coke yards are gorged to the utmost limits with coke and it will require many weeks with an unusually large car supply to relieve the region of the surplus coke.

Prices for coke in small lots and for prompt delivery have been soaring very high the last couple of weeks. Some foundries are reported as offering $3.50 to $4 per ton for immediate delivery. Tempting as the offer was, and with 200,000 to 300,000 tons of coke on the yards the fancy offers could not be accepted. The full output of the region is sold on contract up to the middle of the year and then it was impossible for the operators to get cars sufficient to take care of the regular trade. With normal conditions, prices for furnace coke are likely to range from $2.00 to $2.50 per ton, but should the situation not mend the consumer that does not have a contract ahead may expect to increase his appropriation for this year's coke.

A summary of the Connellsville region for the week shows 20,447 ovens in blast and 1,558 idle.

The following figures show the scope of operations.

Production for the week	180,673 tons.
" last week	240,185 tons.
Decrease	59,512 tons.
Shipments for the week	8,659 cars.
" " last "	7,479 cars.
Increase	1,180 cars.
Shipments in tons for week	192,663 cars.
" " " last week	166,407 cars.
Increase	26,256 cars.

Masontown Field

Shipments for week	307 cars.
" last week	422 cars.
Decrease	115 cars.
Shipments for week	7,982 tons.
" last week	10,972 cars.
Decrease	2,990 tons.

Distribution—

To Pittsburg and river points	3,545 cars.
To points West of Pittsburg	3,718 tons.
To points East of Everson	1,396 tons.
Total	8,659 tons.

Coke Prices.

Pittsburg—Furnace, $2.25@2.50. Foundry, $2.50@2.75.

St. Louis—Connellsville, $5.25@5.50. West Virginia, $4 25@4.50

Cincinnati—Connellsville, $5.00@6.25. Kanawha, $4.25@4.50

Stonega, $4.00@4.25

Personal.

John F. O'Dea, assistant general manager of the plant of the Youngstown Iron & Steel Roofing Company, has tendered his resignation. It was offered several weeks ago and took effect January 1. Mr. O'Dea retires from the roofing company to devote his entire time to a project which he is not prepared to announce. He was one of the promoters and builders of the steel roofing company.

A. R. Fraser, secretary and treasurer of the Pressed Steel Car Company, has resigned these offices and his place as a director of the company to take effect at the time of the annual meeting next month. Mr. Fraser will become associated with J. M. Hansen and others who are leaving the Pressed Steel Car Company to form the Standard Steel Car Company. The office of secretary of the Pressed Steel Car Company has been assigned to A. H. Larkin, of New York, who is a director of the company and its New York counsel. T. Hart Given, president of the Farmers' Deposit National bank, elected a director of the company at the last meeting of the directors may become treasurer of the company. James H. Reed and T. Hart Given, of Pittsburg, and H. E. Moller, of New York, have been elected members of the board to succeed Chairman Charles T. Schoen and E. A. Schoen, of Philadelphia, and Pittsburg, and E. Hawley, of New York.

Timely Trade Reminders.

The Joseph Dixon Crucible Company of Jersey City has again given us a demonstration of the varied products manufactured in the line of lead pencils, erasers, colored pencils, etc. A box of lead pencils, of various sizes and shades, together with colored crayons, ink and pencil erasers is indeed weclome. The Dixon company is the greatest in this line in the United States having outstripped all competitors. This is due to the excellence of their products and the fact that they are liberally advertised. This concern does not believe in hiding its light under a bushel, and the extensive increase in the plant attests the excellence of its business methods. Among the new products sent us this year is a metal case containing a pencil much like that used by carpenters, but it is small and dainty for carrying in the pocket. It might prove excellent for drawing as well as for other writing. The colored pencils made by the Dixons are the acme of excellence.

The Wellman-Seaver Engineering Company, Cleveland, O., has sent out Christmas and New Year greetings in the shape of a large pictorial book, filled with pen and ink sketches by Donahey, a sketch artist of Cleveland. "The Wellman-Seaver Engineering Company, a concern doing business from Joliet to Jericho, wherever and whenever it can corral a customer, sends this little book of sketches drawn by a fellow-townsman, with cordial Christmas and New Year greetings" is the only announcement made by the firm. It is not a catalogue, nor is any attempt made to picture the mechanical devices this concern has invented. It is a comic picture book from start to finish and a jolly good one. It is evident that this concern is a money maker as it cost a nice sum to print and distribute such a work among its patrons and friends.

The Metal Markets.

LONDON—Tin—£106-£105 5s. Sales, 250 tons spot; 350 tons futures.

Copper—£48 10s-£47 10s. Sales, 150 tons spot; 800 tons futures.

Lead—£10 3s 9d

Spelter—£16 17s 6d—£16 15s.

NEW YORK—Tin—$23.70-$23.60.

Copper—Lake, $13.00; electrolytic, $12.87½; casting, $12.50.

Lead—$4.00.

Spelter—$4.40-$4.37½.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including December 30, 1901:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS
Transit	762,836	427,789
Tidewater	202,440	101,919
Southwest	45,993	276,031
Eureka	82,140	948,582
Buckeye, Macksburg oil	1,220	368,917
New York Transit	780,102	
Southern	720,142	....
Crescent	204,777	....
Total	2,699,650	2,123,238
Daily averages	93,295	78,837

LIMA.

Buckeye / Indiana Local Division	1,362,405	1,324,644
Daily average	46,979	45,671

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
December 25	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
December 26	1.30	1.15	1.15	0.83	0.80	0.80
December 27	1.30	1.15	1.15	0.83	0.80	0.80
December 28	1.30	1.15	1.15	0.83	0.80	0.80
December 30	1.30	1.15	1.15	0.83	0.80	0.80
December 31	1.30	1 15	1.15	0.83	0.80	0.80

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$5.10@5.15
Bessemer Steel, 100 lbs.	$4.95@5.00
Bessemer Steel, 95 lbs.	$4.90@4.95
Bessemer Steel, 90 lbs.	$4.85@4 90
American Charcoal Terne—I. C., 14x20 ordinary	$6.10
I. C., ordinary	$10.00

American Coke, f. o. b. mill, quoted at $4.80 for full weight, 14x20; $4.00 for 100 lbs.; $3.95 for 95 lbs., and $3.90 for 90 lbs. of Foreign Coke, Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $5.50 Bessemer Steel, 100 lbs. $5.25.

A Lively Small Plant.

John Eichleay, Jr., of this city, is handling all structural shapes, having beams from 3 to 24 inches; channels from 3 to 15 inches: all sizes of angles, tees, zees, plates, bars, and cast and steel columns which he is disposing of in mill lengths; also cut up to any length or shape; any of the above riveted, punched and erected, and is prepared to do all classes of builder's iron work such as hog anchors, chains, etc.

He has all facilities for getting out material promptly, having steam derricks to handle material into and out of the yard; has a number of slow cold cut saws; is placing in his yards a high speed saw which will cut with great speed, the size of the material being of no consequence whatever; has shears, punch, drill, engines, and everything necessary to quickly fill orders, and is constantly adding new machinery; is supplying material for the large firms in Pittsburg and vicinity, and is filling orders all over the country, a few of those outside of the city being noted as follows:

Pennsylvania Railroad Company, Verona, Pa.; Harrington-Robinson Company, Boston, Mass.: Mosher Manufacturing Company, Dallas, Texas; Loew Filter & Manufacturing Company, Cleveland, O.; White Steam Wagon Company, Indianapolis, Ind.; Nichols & Matthews, Wellsburg, W. Va.; Otis Elevator Company, Rochester, N. Y., and Chicago, Ill.; Wichita Water Company, Wichita, Kan.; H. J. Reedy Company, Cincinnati, O.; Atlas Engine Works, Indianapolis, Ind.; Stratford Bridge & Iron Company, Stratford, Ont., Canada; Champion Bridge Company, Wilmington, O.; Fort Pitt Bridge Works, Canonsburg, Pa.: Raine-Andrews Lumber Company, Gladwin, W. Va.; Central Glass Works, Wheeling, W. Va.: Sheffield Car Company, Three Rivers, Mich.; Camden Iron Works, Camden, N. J.; Mt. Vernon Water Works Company, Mt. Vernon, Ind.; Paige Woven Wire Fence Company, Monessen, Pa.; Columbian Fire Proofing Company, Bloomington, Ind.: Warren City Boiler Works, Warren, O.; Illinois Bridge & Iron Company, Sullivan, Ill.; Bellaire Boiler & Structural Iron Works, Bellaire, O.; Pittsburg Plate Glass Company, several branches; Eagle Iron Works, Des Moines, Iowa.; George D. Shore & Brother, Sumter, S. C.; Western Bridge Company, Chicago Ill.; Birmingham Water Works, Birmingham, Ala.; Dewey Brothers, Goldsboro, N. C.; A. B. Day Foundry Company, Knoxville. Tenn.; Ashland Sheet Metal Company, Ashland, Ky.: Charles E. Billin & Company, Chicago, Ill.: Fanning Manufacturing Company, Chicago, Ill.; Laconia Company Car Works, Laconia, N. H.: A. Plammondon Manufacturing Company, Chicago, Ill.; Stillwell-Bierce & Smith-Vaile Company, Dayton, O.; Eggleston Brothers & Company, New York, N. Y., and other firms.

Notes of the South.

Official figures for eleven months and a careful estimate for December show shipments of pig iron, steel and water pipe from the Southern field in 1901 were as follows: Shipments of pig iron from Alabama and Tennessee, 1,554,732 tons, an increase over 1900 of 226,992 tons; exported, 22,199 tons: shipped from Birmingham district alone, 797,204 tons; from the Sheffield, Ala., district, 211,809 tons; from the Chattanooga district 237,934 tons; from the Nashville district, 93,910 tons; from the Anniston, Ala., district, 184,975 tons; from the Middlesboro, Tenn., district, 27,836 tons. Total shipments of cast iron pipe from Alabama and Tennessee were 162,343 tons, an increase over 1900 of 73,393 tons; exported 2,900 tons against 9,700 tons in 1900; shipped from Birmingham district, 80,633 tons; from the Anniston district, 41,267 tons; from Chattanooga 40,836 tons. Of the export iron Birmingham furnished 20,596 tons, the rest coming from Anniston, Nashville and Chattanooga. Of the exported pipe Birmingham furnished 1,600 tons, Chattanooga 56 tons and Anniston 1,193 tons. The decrease in the exportation of pig iron was very large, the exports in 1900 being 238,000 tons against the 22,000 in 1901. Shipments in 1901 represented manufacture and hence it is seen that there was an increase in the amount of metals made in 1901 over 1900. Steel shipments from Ensley were 61,323 tons.

L. B. Musgrove, general manager of the Corona Coal and Iron Company, states that the Walker county coal mines will do a business of 500,000 tons of coal down the Mississippi river via Greenville, Miss., this year, contracts sufficient to insure that amount of business having been made or assured. Last year's business was 250,000 tons.

The Coosa Valley Coal, Iron & Mining Company decided at its meeting in Anniston last week to meet in Gadsden, January 16, at which time the capital stock will be increased from $50,000 to $100,000. The company is operating coal mines near Sligo, Ala. W. E. Knox, of Anniston, is president.

Frank S. Gannon, general manager of the Southern Railway, while in Birmingham last week, stated that the orders for cars given the Southern Car & Foundry Company and the Mt. Vernon Car Manufacturing Company and on which delivery has been delayed, were bein

hastened and that he expected in the near future to be able to fully remedy the car shortage on the Southern system.

The Tennessee Coal, Iron and Railroad Company has found the use of crude Texas oil for heating work in the steel plant at Ensley a success, the experiments with the heating apparatus of the furnaces being productive of good results. On account of high freight rates, however, the oil is a trifle too expensive as compared with the Alabama coal dug on the spot.

A charter has been issued to officials of the Louisville and Nashville Railroad Company for the building of a branch road to the properties of the Long Branch Coal & Railroad Company. The new line will be seven miles long and serve to develop coal and iron holdings.

The Avondale Stove & Foundry Company will soon build a stove and holloware plant on Ninth avenue, Birmingham, where a large tract of land was recently bought. Cast iron product will be the exclusive output.

The Tombigbee Oil, Gas & Salt Company, capital $200,000, has been organized by Dr. Grattan B. Crowe, of Birmingham, and S. A. Hobson, of Woodstock, Ala.

The Southern Railway bought $60,000 worth of property in Birmingham adjacent to its car shops, last week. The shops are to be extended.

The two stove foundries at Sheffield announce that both industries will be enlarged during the year.

The Birmingham, Bessemer & Gate City rolling mills resumed operations Monday.

Exports of Machines.

In the latest quarterly number of the statistics of the German Empire, some very interesting figures are given of the export machine trade of certain countries. The following table shows the relative importance of each country and the progress it has made in the last decade:

	Exports. 1891	1900
Germany	$16,065,000	$54,454,400
Belgium	7,893,700	11,136,100
France	8,762,200	11,850,200
England	76,890,700	95,383,400
Austria-Hungary	1,786,400	3,126,200
Switzerland	3,956,500	9,302,600
United States	19,500,000	71,600,000

According to this table, England, the United States and Germany are the most important exporting countries. Switzerland's export has increased fairly well. In France and Austria-Hungary there is an unusually large demand for machinery—a fact which our manufacturers should not lose sight of. Consul J. F. Monaghan of Chemnitz, Germany, who sends the information says he finds it impossible to obtain a list of machines imported by these different countries which no doubt would be of interest to our trade.

Scaife Interests Incorporated.

The William B. Scaife & Sons' Company, with a capital of $850,000 has been incorporated under New Jersey laws. This interest is one of the oldest foundry and construction concerns in this district. It was established in Pittsburg in 1802.

The New Jersey charter will convert the copartnership into a stock company, increase the investment and extend operations. Great extensions are projected for the works in Oakmont, but are not yet definitely decided on.

The present leading interests in the company are W. B. Scaife, Jr., C. C. Scaife, and C. C. Scaife, Jr. The same interests will continue in the incorporated company. The concern has a wide reputation as the producers of air and gas pressure tanks, erectors of iron buildings, sheet and plate iron works, range boilers and various specialties. The original works and offices of the company are at 221 First avenue.

OBITUARY.

Amos Pickard, who was closely associated with the first attempts at coke making in Western Pennsylvania, died at the home of his daughter —Mrs. J. B. Henry—in Connellsville late last week, aged eighty-three. Mr. Pickard was born in Germany and came to the United States when a young man and settled at Brady's Bend, later going to Connellsville. For a number of years he was superintendent of the Ferguson coke plant.

Technical Bodies.

A regular meeting of the Engineers' Club of Philadelphia will be held Saturday, January 4. S. W. Stratton, director United States Bureau of Standards will read a paper on "The Relation of the National Bureau of Standards to Engineering and Manufacturing Interests."

From the Trade

The Mahoning Foundry Machine Company, Youngstown, O., is sending out to the trade a neat card case and pocket book which is conveniently arranged.

Wickes Brothers, Pittbsurg, are distributing a pocket book containing a catalogue descriptive of their line of goods.

Will Make Gas Engines.

The Anchor Engineering & Machine Company, of this city, has been re-organized mainly to engage in the thorough production of the Anchor gas engine and general rolling mill machinery.

The Anchor gas engine is an invention of Alex Backstrom, a well known mechanical engineer, who years ago brought out a mechanical cream separator, which is now generally used. Subsequently Mr. Backstrom became connected with George Westinghouse with whom he brought out a steam engine, that proved to be the first practical and successful engine of its kind. The Anchor gas engine, Mr. Backstrom's latest achievement has a number of novel features, which have advantages that will at once place it at the head of gas engine construction. One remarkable feature of this engine is its high speed, the 30 h.p. running at 1,200 revolutions per minute.

The engine has been thoroughly tested and subjected to all kinds of the severest practical trials, which demonstrated its success. A 30 horse-power engine is now under construction for a large restaurant in this city where it will be installed by the middle of January to run a light and ice plant. Drawings and patterns are now being made for engines ranging in capacity from 10 to 1,000 h. p. All these engines will be made by the Anchor Engineering & Machine Company and they will be sold to large electric lighting plants, to street railway plants, to rolling mills, in fact, wherever power is used in large quantities. This engine will do more to displace and supersede steam power, than any engine of its kind that has yet been placed upon the market.

The rolling mill machinery, which the company will make, is controlled by patents granted to C. Kuhlwind, the president and manager of the Anchor Engineering & Machine Company. Mr. Kuhlwind has been prolific in his achievements of improvements and new developments in the construction of rolling mill machinery and many of his devices are used in the largest mills both in this country and in Europe. These patents are upon improvements for rolling plate and bar iron and steel, which add to the saving of time and labor, thereby greatly reducing the manufacturing cost of this material.

The company expects in the near future to erect a plant of its own where it will be possible to turn out its products on a large scale. The Anchor Engineering & Machine Company has had a phenomnal growth, as it is one of the youngest companies in the city. The company acquired the property of the old Anchor Machine Company last spring and then formed the Anchor Machine Company, limited. The works are located on Scott place near Penn avenue and Seventh street, where has been carried on a general machine shop, making a specialty of finer repair and experimental work, gear cutting, die making and model making. This work rapidly increased to such an extent that it became necessary to branch out, and the result has been the formation of the new company with a capital stock of $150,000, which, however will be increased by the first of April on account of the fact that the company is going into the manufacture of the Anchor Gas Engine and also the making of rolling mill machinery

The Rarig Works Busy.

The Rarig Engineering Company, Columbus, O., has recently taken contracts for blast furnace work, etc., that compelled it to operate the large works day and night. An order for a 30,000,000 gallon pumping engine was recently received from the Indianapolis Water Company, Indianapolis, Ind., which will be of the latest pattern. It is remodeling Pioneer furnace No. 3 of the Republic Iron & Steel Company, Birmingham, Ala., and installing two cross compound blowing engines; building two 26-inch billet mills for the Youngstown plant of the Republic Iron & Steel Company; erecting a complete furnace plant for the LaFollette Furnace Company, LaFollette, Tenn., which will have a bosh of 20 feet and be 95 feet in height, including stoves, engines, boilers, etc.; shipping a horizontal cross compound blowing engine to the Bingham Copper & Gold Mining Company, Bingham Junction, Utah, and turning out one mortar gun carriage each week for the United States government.

Platinum in Canada.

Consul Dudley sends the following from Vancouver, December 7, 1901:

The superintendent of the assay office here has reported to the press that among the specimens of gold brought to him to be refined, he has found considerable quantities of platinum, and he is under the impression that the miners do not know platinum when they see it. In all the placer-mining districts of British Columbia and the Yukon Territory, large amounts of platinum and kindred metals have been thrown away by miners who did not know the value of the product. With the present price of platinum it will pay prospectors to be on the lookout for this metal, which doubtless exists in considerable quantities in this Province. Platinum is not found in ledges, so far as is known, excepting in one place in the world. It is found in black sand containing a large percentage of magnetic iron ore and a varying quantity of gold.

In the Cincinnati District.

A contract for electrical machinery has been awarded to the Bullock Electric Manufacturing Company, by the Allis-Chalmers Company, that is quite gratifying to the Cincinnati concern, when it is known that it was given the contract over some other electrical concerns of highest standing, and was not the lowest bidder. The contract calls for $40,000 worth of machinery to be used in the Milwaukee plant, on which several millions of dollars are to be expended in the next year or so. The machines to be placed by the Bullock Company will be direct connected motors for running some of the larger tools. It is considered rather evening things up that, while the Cincinnati Gas & Electric Company awarded recently a large contract for engines to the Allis-Chalmers Company at the same time that it awarded contracts to the Bullock Company for two large generators, the Allis-Chalmers Company now places a large order with the Cincinnati electrical concern for machinery that will probably be used, in part at least, in the manufacture of the very engines that are to be set up in this city.

A contract has practically been let to the Laidlaw-Dunn-Gordon, Company of Cincinnati, for three engines, for the Spring Valley Water Company, which supplies San Francisco with water but owing to the delay in the mails consequent upon the cold snap, the formal exchange of documents in that connection has not been made. Each of the three engines will have capacity of 4,000,000 gallons every twenty-four hours. The cost of the engines alone will be about $70,000. The first engine, it is expected, will be delivered some time in April and the last during July.

The Cincinnati Planer Company has just been awarded a contract for six car loads of 36-inch planers by the Baldwin Locomotive Works. This order follows others for the same sort of machinery, and in the past 18 months the Cincinnati concern has received orders for 20 car loads of planers.

The Ritter Electrical Company, Cincinnati, capital $15,000, was incorporated last week, by William Ritter, Joseph Grimsley, Irvin A. Ashley, Adelhart Bietz and John N. Ritter.

The contract for building two new 250 horse power water tube boilers has given been to the Tudor Manufacturing Company, of Cincinnati, for $3,939.

The Keystone Stove Foundry, Spring City, Pa., has been organized with a capital stock of $60,000.

Russia Not Daugerous Now.

Archer Brown, of Rogers, Brown & Company, says it will take 100 years of development for the Russian laborer to reach a plane were he will be as competent as the average American skilled laborer; also that Russia as a field for the investment of American capital is absolutely unattractive at present.

Mr. Brown returned a few days ago from a trip through a part of Russia, covering a period of about two months. He says of his observations:

"The workingmen of the United States have nothing to fear in Russian competition. Financial conditions there at present are almost as bad as in Germany, where there has been a long period of over production. The Russian iron masters last year produced about 2,000,000 tons of iron, but it was not of good quality. The iron industry in Russia lacks two essential things to make it worthy of consideration from a world wide point of view, namely, honest and able management, and a good grade of ores. No high-grade ores have as yet been discovered in Russia. They have superior ore in China, and it is possible they will, uncover some in Russia, but as yet they have none. French stock companies have been badly bitten by spending their money in trying to develop industrials in Russia, and I cannot see where there is any attractiveness for an American investor. There is a manifest lack of character in officialdom that reacts potentially on the empire's industrial development. This is perhaps a harsh thing to say of a friendly nation like Russia, and, of course, every one must realize that there are large numbers of honest men and women in the country, but it is a fact, nevertheless, that dishonest officials take advantage of their position to hamper legitimate industry."

Wire and Nails.

Wire, plain, car lots, jobbers	[illegible]
Galvanized, car lots, jobbers	[illegible]
Wire, plain, less than car lots, jobbers	[illegible]
Galvanized, less than car lots, jobbers	[illegible]
Wire, plain, car lots, retailers	[illegible]
Galvanized, car lots, retailers	[illegible]
Wire, plain, less than car lots, retailers	[illegible]
Galvanized, less than car lots, retailers	[illegible]
Wire nails, car lots, jobbers	[illegible]
Wire nails, less than car lots, jobbers	[illegible]
Wire nails, car lots, retailers	[illegible]
Wire nails, less than car lots, retailers	[illegible]
Cut nails, car lots	[illegible]
Cut nails, less than car lots, jobbers	[illegible]
Cut nails, car lots, retailers	[illegible]

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	16¾	to [illegible]
Copper, light bottoms		[illegible]
Heavy Composition		[illegible]
Brass Turnings		[illegible]
Heavy Brass		[illegible]
Light Brass		[illegible]
Heavy Lead		[illegible]
Tea Lead		[illegible]
Zinc Scrap		[illegible]
No. 1 Pewter		[illegible]

Patents.

The following patents granted November 26, 1901, are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa., from whom printed copies may be procured for 15 cents each:

Process of producing nickel salts, H. A. Frasch, Hamilton, Canada; steam governor, Willard Kitts, Bradrick, O.: machine for forging nuts, etc., A. M. Reynolds, Birmingham, England; igniter, J. B. Boisselot, New York; steam boiler, William Hornsby, David Roberts and Charles James, Grantham, England; furnace grates, William McClave, Cranton, Pa. 3; means for magnetically separating different substances from each other, C. F. McKenna, New York; engine frame. J. A. Secor, Brooklyn, assignor to the General Power Company, of New Jersey; cooling cylinders of explosive engines, same; blasting agent, Hans von Dahmen, Vienna, Austria-Hungary, wire hoop machine. A. F. Dick, Joliet, Ill.; fine fuel feeding apparatus, G. S. Emerick, Philadelphia; apparatus for continuous casting of pig metal, J. M. Hartman, Philadelphia; iron notch for blast furnaces, same; boiler furnace, John Van Develde, Cleveland; boiler flue coupling, G. L. Autenreith, Kansas City; steam engine indicator, J. C. Dobbie, Glasgow, Scotland; shaking grate, G. S. Herrick, Syracuse, N. Y.; feeding apparatus for rolling mills, H. E. Sheldon, Leechburg, Pa.; gas producer, William Swindell, Allegheny; apparatus for manufacturing weldless metal tubes, Corrado Ciangherotti, Genoa, Italy; cut-out for cranes, G. A. Hassell, McKeesport, Pa.: gas producer, Harry Hyatt, Cleveland, assignor to the Wellman-Seaver Company, same place; corrugated boiler furnace or flue, Joseph Nodder, Sheffield, England; air compressing cooling apparatus, Rudolf Berg, Pittsburg; apparatus for distilling sawdust, E. S. Hutchinson, Washington, D. C.; apparatus for silvering glass, Constant Laval, Allegheny: annealing box, Patrick Meehan, New Castle ,Pa.; direct acting steam engine, Frank Pratt, Jolimont, Victoria; feeding water into boilers, Ebenezer Shackelton, Birkenhead, and Frank Flather, Seacombe, England; coal auger posts, Alexander Walker, Whatcheer, Iowa; non-rotative pumping engine. Luigi D'Auria, Philadelphia; stop mechanism for engines, W. F. Bradbury, Kansas City, Kan., and D. E. Washington, Kansas City, Mo.; explosive gas motor, Eugen Cailavet, Villenuve-sur-Lot France; speed-regulating clutch, H. S. Credelbaugh, New Carlisle, O.; steam boiler, W. N. Oldman, Buffalo.

West Virginia Notes.

The Buckhorn Portland Cement Company works, recently sold to Colonel John T. McGraw, for $67,500, it is believed will be turned over to a New York syndicate. A proposition is being considered to dismantle the works, the machinery alone, all of it new, being worth at the lowest estimate $90,000.

George L. Hibbs, J. R. Barnes and J. E. Barnes, of Uniontown, Pa., have bought 670 acres of new coal land in Harrison county for $120,125 and will open mines. Col. T. Moore Jackson, of Clarksburg, has bought 3,800 acres of land owned by the Tenmile Coal & Coke Company, near Clarksburg, for $215,661.

The North Maryland Lumber Company, of Warren, Pa., has been chartered by C. E. Vincent, of Buffalo; and J. W. Wiggins,; J. B. Phillips, L. D. Patterson, and A. B. Cogswell, of Warren, Pa., to acquire and operate lumber properties, shingle, planing and other mills.

The Davis-Elkins syndicate has bought five miles of coal road in Upshur county built by Dr. G. A. Newlon. The road it is believed is to become a part of the new system across West Virginia to the lakes.

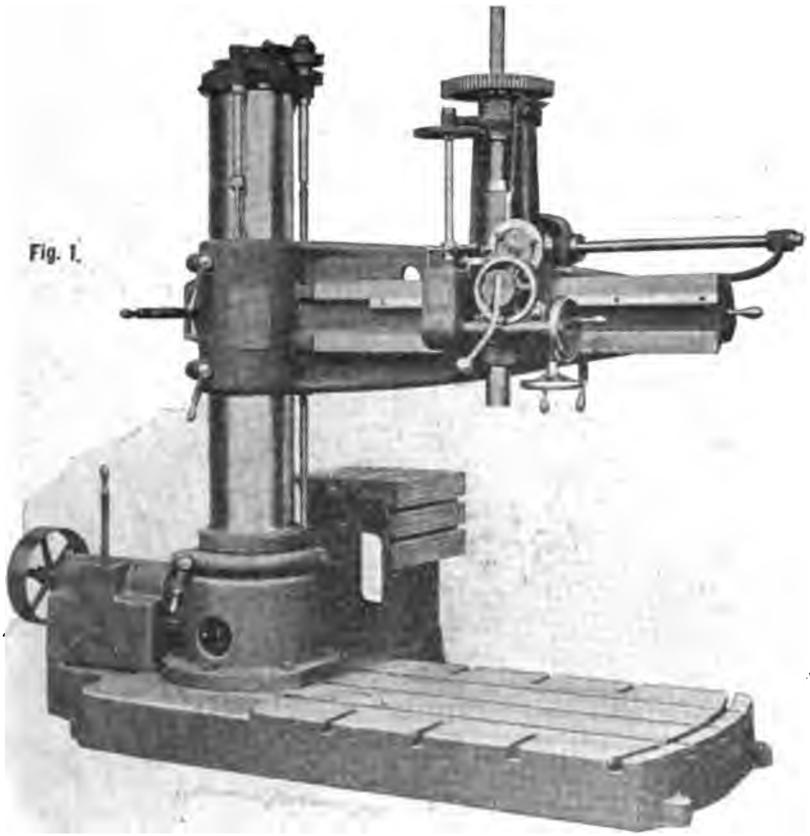
Five car loads of new machinery have been received for the Citizens' Ice Company, at Clarksburg.

BICKFORD'S NEW RADIAL DRILL.

IT is probably a fair statement that the radial drill has developed less during the past fifteen years than any other standard type of machine tool. It would seem that other tools—particularly the several types of lathes—have so engrossed the attention of designers that the radial drill has been more or less neglected and the possibilities of its development rather lost sight of.

The Bickford Drill & Tool Company, of Cincinnati, Ohio, has just placed upon the market the new radial drill that we illustrate here. This machine possesses many novel features, and gives evidence throughout of a bold effort to introduce at once every means of augmenting output, while at the same time increasing the accuracy of the work done.

Fig. 1.



The machine is provided with a wide range of speeds and feeds operated through nests of gears that give instantly any speed and feed without stopping the spindle; a depth gauge for reading all depths from zero; a multiple automatic trip that can be set to operate at as many different depths as there are holes to be drilled; an absolute safety stop; and a tapping device that operates at all speeds. All the adjusting levers are within easy reach of the operator and changes can be made so quickly that there would seem to be every reason why on this machine the several sizes and kinds of tools used should be operated at their correct speeds and feeds.

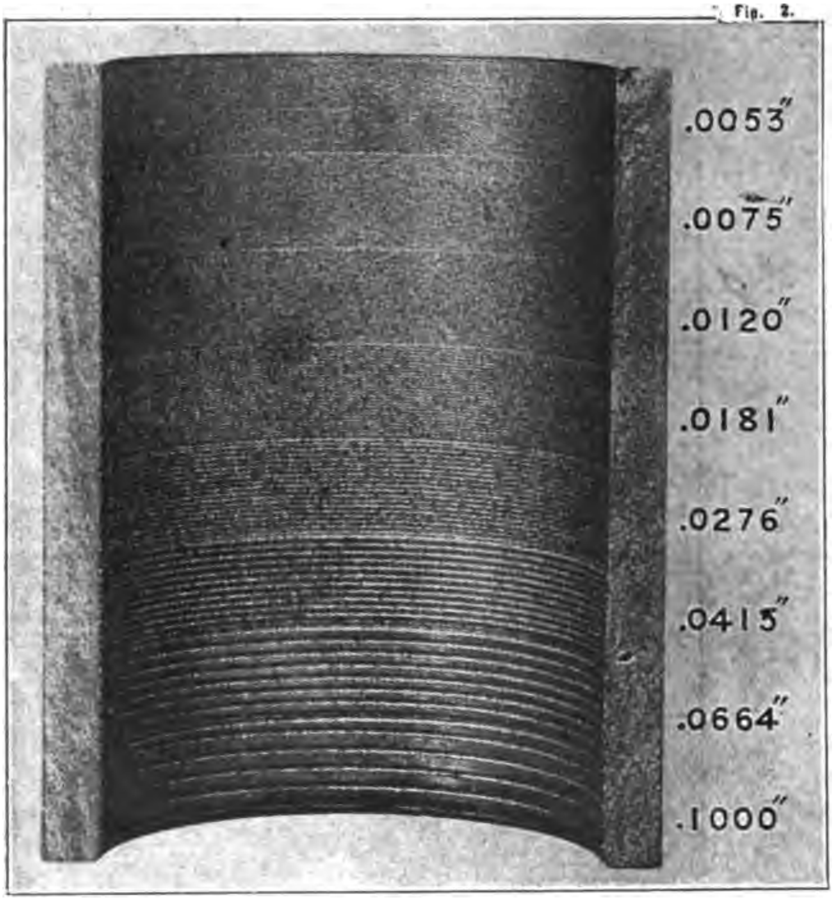
The power is applied to a single driving pulley and is transmitted through a speed box mounted on the base at the left of the column. The single lever shown

gives any one of four speeds instantly without stopping any part of the machine, by operating the friction clutches shown in the sectional view, Fig. 2.

This speed box takes the place of the customary cone pulley. The advantages claimed for it are that it does away with all belt shifting; prolongs the life of the belt; gives great economy of power—the belt speed being constant and the pull, therefore, directly proportional to the power absorbed at the drill; can be driven with unimpaired convenience from below the floor—when the arm is free to describe a full circle about the column, permits setting the machine at right angles at the line shafting by using a quarter twist belt; and is equally efficient when driven electrically because it permits the direct connection of a constant speed motor.

The second shaft of the speed box transmits through mitres to the back gears. These are mounted in a box bolted to the back of the cuff, or sleeve, of the arm, and

Fig. 2.



are operated through friction clutches, without stopping any part of the machine, by the pair of levers shown at the extreme left of the arm. An engraved index plate on the cuff tells the operator how to manipulate these levers. The speed box and back gears together give 16 spindle speeds, which are arranged in geometrical progression from 16 to 256 revolutions per minute. The back gear shaft transmits to the head and through a simple train of gears to the drill spindle.

The feed box is mounted on the head immediately to the left of the drill spindle and contains a nest of gears that give instantly any one of eight feeds ranging in geometrical progression from .005 inch to .1 inch per revolution of spindle.

The method of feed changing is shown in Fig. 3. The sliding key A is hinged to the pull in B; there are three key-ways in each gear and between each pair of ad-

jacent gears there is a steel ring so shaped that the key is free to be moved at any instant to any one of the four gears and then engages automatically with the first of the three key-ways that comes round.

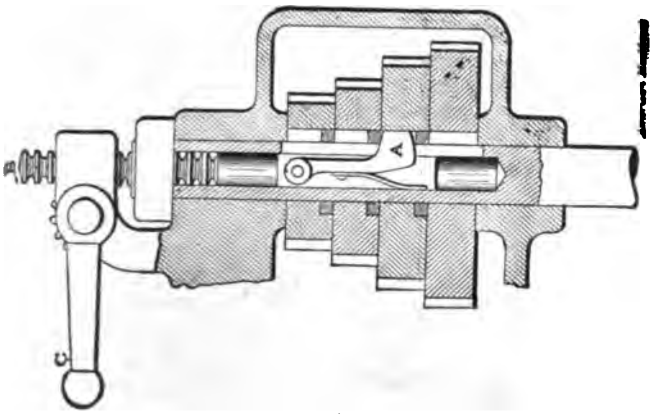
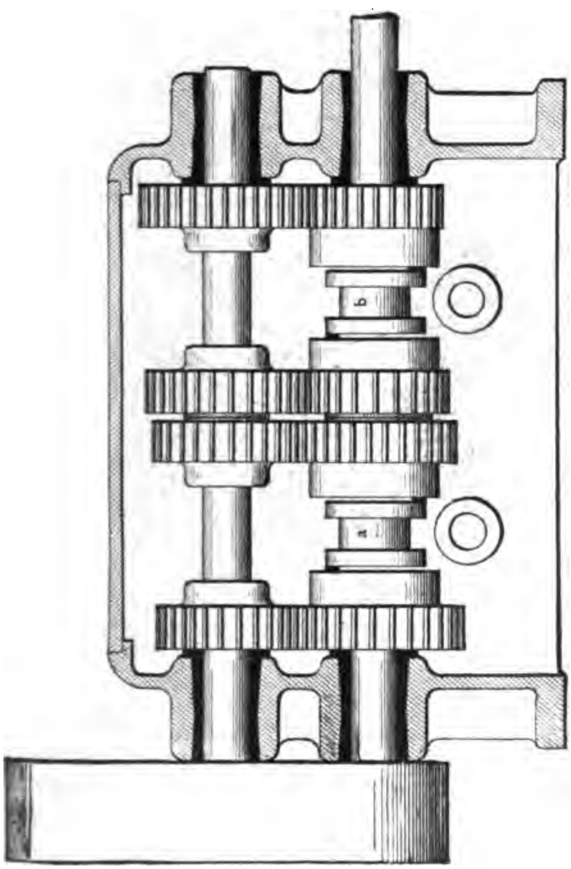


Fig. 3.

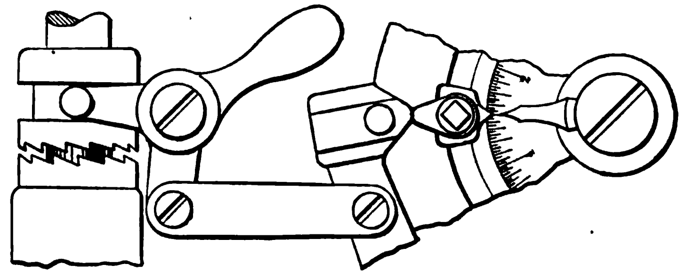
It will be seen that the position of lever C, a quarter turn of which changes the feed either to the next higher or the next lower, indicates which of the gears is operating. The cone of gears shown gives four of the eight feeds; the other four are obtained by means of a similar pull pin key actuating two gears immediately below. Taken together, the feed changing, speed box, and back gear levers give practically instantaneous speed and feed changes—a feature of no small importance when it is remembered that the time required to drill an average hole is a matter of seconds rather than minutes, so that any time spent shifting belts or locking and unlocking back gears decreases by a very large percentage the possible output of the machine. The engraved plate on the front of the feed box gives positions of levers for the eight feeds. The range of these feeds is effectively indicated in Fig. 4 ; the specimen shown was prepared without stopping the spindle—each half inch of traverse being read direct on the dial depth gauge—and with only sufficient interruption of the feed to give a clear line of demarkation between changes.

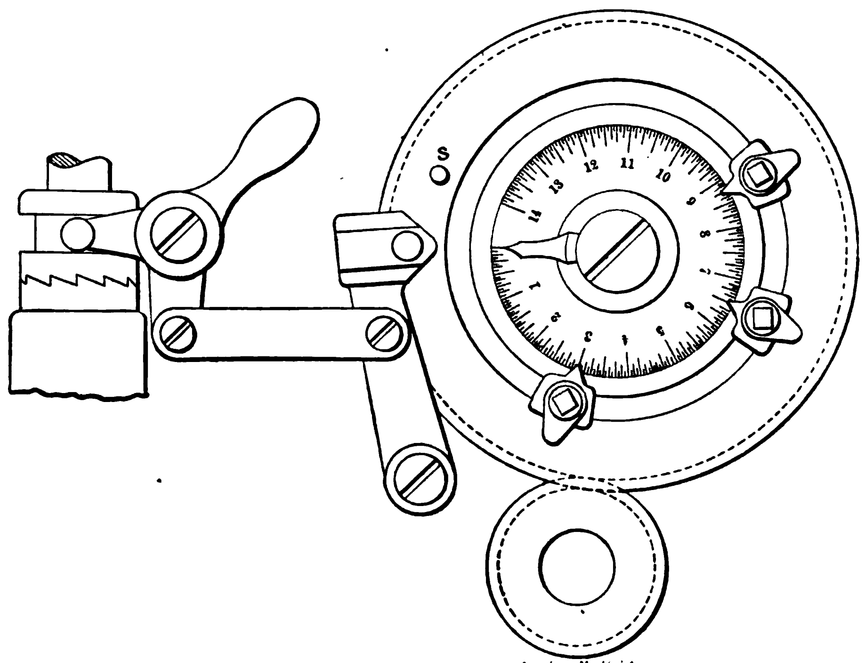


One of the most novel features of the machine is the zero depth gauge and multiple automatic trip. Fig. 5 in the lower view shows this trip and gauges for drilling three holes, the respective depths of which are three, six and one-half, and eight and three-fourth inches. To set, the graduated dial is turned until its stop pin brings it zero opposite the fixed pointer; the dogs are t en set by

the graduations on the dial for the depths required. An important feature of this tripping mechanism is that while drilling the 8¾ inch hole, for which the third dog is set, the other dog can be rendered inoperative by simply lifting a latch on the clutch-pawl; or if by any chance the workman neglects to lift the latch and so permits an intermediate dog to trip, the feed can be continued without interruption by throwing the clutch in again by hand. The upper view of Fig. 5 shows the first dog at the moment of tripping.

Fig. 4.





American Machinist

The safety stop, S, Fig. 5 is a steel pin permanently secured in the face of the tripping gear. When the spindle reaches the end of its traverse this pin engages positively with the fixed part of the clutch-pawl and makes it impossible for the feed to be continued or the clutch thrown in again until the spindle has been raised.

In the general design of the machine great rigidity has been aimed at by making the arm as well as the column in pipe section so as to overcome both the twisting and the bending stresses, while to take care of exceptionally severe conditions the base has been provided with a circular arc slot from which the end of the arm can be supported.

It will be noticed that the hand wheel for operating the head is on the head itself immediately in front of the tapping lever.

The machine is being built in four styles—in which modifications of some of the above features are introduced—and in three sizes, to drill to the centers of 8 feet, 10

feet, and 12 feet circles respectively. The illustration shows the smallest size; this has a total vertical feed of 15 inches and will, the makers assure us, pull a 4-inch twist drill through solid cast iron under a feed of .012 inches per revolution.

We understand that the novel features are being well covered by patents. We may add that an exceedingly interesting and instructive booklet entitled "56 Points of Vantage" has been published by the Bickford Drill and Tool Company, in connection with their new line of radials, in which the general design of drilling machinery as well as the proper speeds and feeds of tools used are ably discussed. This booklet can be had upon application.

Graphite Iron Notch for Blast Furnaces.

IT is of great importance to the proper operation of a blast furnace, that it be furnished with an iron-notch which is sufficiently refractory and strong to maintain a substantially constant aperture, notwithstanding the great heat to which it is subjected, and the abrasive action of the escaping molten iron and basic cinders tending to wear it away. Otherwise the rate of flow of molten metal becomes too rapid.

Hitherto, the effort to protect the notch has resulted in a construction wherein, the narrowest part is situated in or near the zone of the water-cooled jacket surrounding the crucible, in order that by thus placing the same within its cooling influence, the notch might be sufficiently protected and thus made permanent. The same effort resulted in a patent granted to John M. Hartman in 1893, in which the notch itself was provided with cooling devices of its own. These arrangements are partially successful, because the cooling of the notch thus effected, prolongs its life and keeps it from wearing away. They have, however, developed a counter disadvantage, in that, by placing the narrowest part of the notch so far toward the exterior face of the crucible it results that a considerable mass of iron or cinder is hardened in or about the region of the notch. When, therefore, it is desired to again tap, it becomes necessary, not merely to remove the clay stoppping, but to drill through this hardened iron. This is not only difficult, but is often more destructive to the notch than the action of the molten metal.

Mr. Hartman has been working at improvements and has devised a structure which he claims overcome all of the disadvantages. He has discovered that it is possible to make an iron notch of graphitic material sufficiently refractory to withstand without cooling, the high temperature to which it is subjected and abrasive action of the flowing metal. By placing the narrowest point of such a notch quite as near to the inner wall of the crucible as practicable, the freezing of the metal within or about the notch is prevented.

He employs a refractory cylindrical breast which is detachably fitted within a flaring aperture made for the purpose in the crucible wall. This breast is provided at its inner end with a removable interior sheathing or bushing correposnding in size and flare to the interior of the breast so that it is socketed tightly within the interior of the inner end. These elements are made of a mixture of plumbago and German fire clay, well mixed and burned. The notch is closed by a mass of soft clay forced well through the notch so as to form not only a plug within the same, but a considerable stopper on the inside. This mass is expanded by means of a suitable bar immediately driven into the same before it hardens. When it is desired to tap the furnace, it is only necessary to break this clay stopper, whereupon the metal can pass through the notch.

What to do When the Gas Engine Stops.

BY ALBERT STRITMATTER.

IT is always very easy to solve a problem in mathematics backwards after you have the answer. Likewise it is very easy to explain difficulties in connection with machinery after you know the cause and how to overcome it. The hard part is when you have the difficulty to overcome and do not know what the cause is or how to find it. Meanwhile the whole or portion of the plant may be shut down and expenses are going on while no work is being done, men are continually coming to ask what the trouble is, etc. Under such circumstances it takes a cool head to keep one's brain working properly for everything is in confusion and tends to make one nervous and excited, preventing a soluion of the problem. On many such occasions further damage is done by reason of not investigating fully the cause of the trouble but guessing at it and then going ahead with the result that something still more serious occurs.

When it is a gas or gasoline engine that is causing the trouble it is particularly essential to ultimate speed and success in overcoming the difficulty that the work of locating the trouble be carried on in an intelligent and methodical manner. If it is not done so, the solution of the question will not be discovered unless accidentally. How foolish it is, for instance, when an engine will not start, for a man to lug at it over and over again for hours at a time in a vain attempt to start the engine without undertaking to use his own brains and find out why it does not start. Yet this is done very frequently and the engine is presented as being a very hard one to start! I should think so. It should not be necessary for a man to go from the factory anywhere from ten to several hundred miles, simply to tell a puzzled engine operator to renew his batteries, to replenish his gasoline tank, to take a brick off of his gasometer, to use more or less gasoline or lubricating oil, or to repack his gasoline pump, etc. Yet this has been done many times and is being done continually for all these and many other equally as foolish reasons. And to cap the climax, in almost every instance the operator has had and has been supposed to read and study a book of instructions giving particular cautions on these various subjects.

Let us suppose we have an engine which has suddenly stopped running. We are sensible and know that the engine has done so because of some legitimate reason and s we will not lug at the fly wheels in vain or telegraph for a man from the factory the very first thing, meanwhile sitting around and cursing ourselves for ever having allowed ourselves to be persuaded into buying such an engine. We will sit down and think a little about how the machine operates.

First, we know that the engine must have fuel in sufficient quantities and in the proper proportions. By fuel we know is meant not only gas or gasoline but also air, for air is as essential to proper results as is the gas or gasoline. Second, we know that after the fuel is drawn into the cylinder it must be properly compressed to give greater power and assist in rapid combustion when the charge is ignited. Third, we know that the compressed charges must be ignited, and fourth, we know that the burned charge must be exhausted. Whatever interfers with this process will result in stopping the engine entirely, or at last in decreasing its power and increasing the fuel consumption per horse-power actually developed. Besides the process mentioned, we know that the engine must be properly lubricated, adjusted, have a proper cooling system, etc., in order to perform its functions with the greatest economy.

Let us see, then, whether our engine is getting the proper supply of fuel. First, we will work our gasoline pump by hand and see if plenty of gasoline reaches the engine. If it does not, there may be no gasoline in the supply tank, the suction pipe may not be air tight, the check valves may not seat properly, or the pump may need re-packing. But even if the gasoline reaches the pump it may not get into the cylinder of the engine. There are a great many devices for this purpose and each may cause peculiar troubles of its own. The operator should understand his device thor

oughly and see that it is kept clean and in proper condition so that its operation will be perfect.

If we have a gas engine, we will see that our gas meter, gas bag or gasometer, gas regulating valves, etc., are in proper condition. Too small a meter may cause trouble. Sometimes a man will take a gasometer to pieces and put it back so that it shuts when it should open, and vice versa.

Then we will see if our air supply is all right. There are different mehods of supplying air to engines. Sometimes they draw air from under the bed, sometimes through a long pipe from the outside of the building. In the latter case obstructions are apt to get into the pipe unless the end of it is protected. In one case a newsboy's hat was sucked into the pipe and stopped the supply of air.

Feeling sure, now, that our engine is supplied with gas or gasoline and air in sufficient quantities, we must be sure that the quality and proportion are right. Water in gasoline causes a great deal of trouble. Gasoline which has been allowed to stand and let the lighter and more inflammable gases evaporate also causes a great deal of trouble. Gas which has been too liberally supplied with air, either intentionally or otherwise, will cause difficulties, as will water in the gas supply pipes. Then the proportion of the gas and gasoline to the air must be correct. This is governed by various devices and the instructions from the manufacturer should give sufficient information on this subject to enable the operator to make these adjustments properly. The color of the exhaust will indicate pretty clearly whether a proper proportion is being secured. The exhaust will be practically smokeless when the proper mixture is secured. Smoky exhaust indicates improper combustion and results from too much gas or gasoline or from too much lubricating oil.

If we have not located the trouble yet, we will try the compression. By pulling back on the flywheels and holding against the compression a few minutes, we can tell whether or not it is all right. If it is not, it may be due to several things. Some of the piston rings may be broken. Or they may be stuck fast into their grooves as a result of too much lubricating oil, and thus fail to hold the compression. Or, the piston and cylinder may be worn to such an extent that it is impossible to get a good compression. Or the exhaust or fuel valves may fail to come to their seats properly, which may be due to their needing regrinding, or because the valve stem are stuck with burned grease and oil. The valves should be re-ground to their seats with emery flour and oil, and the stems and bearings in which the stems work shoulds be thoroughly cleaned up. Or, the lever or other devices opening the valves may be so out of adjustment that the valves are not permitted to come clear down to their seats. The power developed by an engine depends to a very large extent on the compression, so that this is a very important point. As the highest pressure developed by the explosion is approximately four and a half times the pressure of compression, it will be seen how vitally the compression affects the results secured.

Having a proper fuel supply and a good compression, we now come to the question of ignition. This is a very extensive question and one of vital importance to the gas engine operator. Space will not permit in this article a detailed discussion of the question. The subject was touched upon in an article which appeared in the issue of this paper for December 19, 1901, and may be more fully discussed at a later date in a separate article. Instruction books of manufacturers generally devote considerable space to this subject and it will pay the operator to become as familiar with the subject as possible, for his knowledge of this question will determine the success or failure of the engine. The batteries of course must be strong, the connections from cell to cell and from battery to engine must be properly made. The spark coil must be kept dry. The igniter points must be clean and make a perfect contact. The igniting mechanism must be operated at the proper time and in a proper manner. This applies to all kinds of electric igniters. If a tube igniter is used, the tube must be of proper length. If it is iron, it must not be allowed to remain until it is oxidized too greatly on the inside.

The igniter of a gas or gasoline engine is frequently referred to as its "soul," which indicates how important it is. There is, however, a very close connection between the spark or flame and the charge of fuel. Frequently when ignition does

not take place a great deal of time is spent in tinkering with the igniter or the batteries while the real trouble may be in the charge of fuel. As has been mentioned before, gasoline which has water in it will cause no end of trouble. While the oil companies of course deny diluting the gasoline with water, and the dealers or retail stores just as presistently claim that they are not guilty, it is frequently done by some one. It can generally be discovered by spattering a little of the gasoline with your finger on to a flat piece of iron or something of that kind. If there is much water in it, there will be little globules of the water which will separate from the gasoline. Otherwise, the gasoline will spread out smoothly all over the iron. While this does not always disclose the presence of water in gasoline, it will frequently do so. This is a difficulty which it is often very hard to locate because the mixture is apparently all right, as is also the compression and the spark, and yet the engine will not ignite.

Many people, too, see no reason why they should not connect call bells, etc., to their engine battery. This may be successful for a while but will result in the battery giving out much sooner than it otherwise would, the result being that they have to be renewed more frequently. It is much cheaper in the end to provide separate batteries for call bells and let the gas engine battery serve for the one purpose of igniting the engine charges. It should also be remembered that the battery must not be put on a shelf and tin cans and other rubbish piled on top of it. If this is done trouble will result from short circuiting the battery.

Another thing to be remembered in renewing "wet" batteries is that new solutions as well as new plates should be put in. Frequently people will put new solutions on to old plates, or new plates into old solutions, with the result that no good is done. Battery manufacturers usually arrange the quantity of the various parts of their cells so that they deteriorate together and it is therefore useless to renew only a portion of them. Above all, do not forget to open the switch when the engine is not in operation. Failure to do this results in wearing out the battery more in a single night than for many months of continuous use.

When a Manufactured Article is Considered Sold.

BY EMANUEL T. BERGER.

SOME discussion has arisen over certain manufacturing contracts as to just when an article, ordered to be made, can be considered as actually sold and the legal title to which may be said to be in the buyer. Some courts have decided that no title passes and an article ordered does not become the property of the purchaser until it is actually accepted by some act or word of the buyer. However, by an examination of the best decisions on this subject it can safely be said that the weight of authority is otherwise. These latter cases all hold that should John Doe order an article to be made by Blank Manufacturing Company, according to certain specifications, and should the manufacturing company produce the thing ordered, within the prescribed time and in all respects according to the specifications, then the title will pass upon a proper tender of the goods even though the purchasers should refuse to accept them. In other words the title to an article passes to the buyer as soon as it has been completed in accordance with his order, unless, of course, there is a written agreement to the contrary.

In a New York case which though not a very recent decision, still illustrates this principle thoroughly, the same conclusion was reached. The Pacific Iron Company agreed with the Long Island Railroad Company to manufacture certain iron castings for it and to ship them, when completed, by steamer to New York city and to pay all the charges of transportation and shipment to that point. The Iron Company manufactured the castings and shipped them to New York but on arriving there the agent was told that they should be delivered to Hunter's Point, L. I.

They were then forwarded to that place and the additional charges of extra transportation were charged to the consignee. However, the Long Island Railroad Company refused to pay these charges, and as the Iron Company insisted upon their

payment, the railroad company refused to accept them or sign a receipt. Thereupon the agent returned the goods and stored them until further developments. The Pacific Iron Company then demanded payment for their castings and upon the refusal immediately began suit. The case came up before a referee first, upon whose report to the lower court a judgement was rendered in favor of the Pacific Iron Company. It was then appealed by the Railroad Company to the Court of Appeals of the State of New York. It was decided by this court that just as soon as the Iron Company had complied with all the terms of their agreement they had delivered and tendered the goods at the proper place in New York, then the goods became the property of the Railroad Company who had ordered them. They further held that the Iron Company was under no obligation to forward the castings to Hunter's Point, L. I., and that in doing so they were merely the agents of the consignee. The title to the goods was transferred as soon as the goods were landed, as per the contract, in New York city. The Iron Company got their money.

It has been decided that no title or right to the goods passes while they are in progress of manufacture. This is a very interesting question, because it has been decided in actual cases which have arisen that even though the buyer paid an installment on part of the work as it progressed, and even though he furnished part of the material and had a representative present to oversee the construction of the article. In a case full of interest this was decided by the United States Supreme Court in regard to the construction of a certain battle-ship But as the case and the litigation connected with it extended over a period of thirty-eight years and fills about 30 pages of printed report, I will merely state that it was held by the court that this battle-ship upon which construction was begun in 1844 and left unfinished, still belongs to the heirs of the contractor even though the U. S. Navy Department had paid installments thereon. The title did not pass until it was completed as ordered. This decision was a wise one so far as the United States was concerned, for a battle-ship completed according to the plans in 1844 would scarcely have added much to our modern navy. Unless, however, the goods ordered corresponded with specifications, no title will pass after they are completed, or until the seller has done everything incumbent upon him and has put the article in shape for the buyer to take it.

Very often the question arises as to whether or not the seller has completed his part of the contract. Often the contract of sale stipulates that the goods are to be delivered to a certain place, or delivered to a certain place and then be set up, or placed in some warehouse, or some similar act to be performed after delivery. In these cases the general rule has been that no title to the article passes until the term of the contract have all been fulfilled, and in a number of cases the question has arisen as to what is a sufficient delivery. Much depends upon the terms of every contract but generally the intentions of all the contracting parties together with the usual customs followed, prevails. In a Michigan case these points were in controversy.

It seems that some years ago the Westerman Company, later Christian A. Buhl & Company, were in the furnace business in Sharon, Pa. This company entered into a contract with the Iron Cliff's Company, a Michigan mining corporation, whereby the latter was to furnish the Westerman Company with 2,000 tons of iron ore of standard quality from their mines, delivered at Erie, Pa., at the dock of the Erie and Pittsburg Railroad Company, which railroad was then under instructions of the Westerman Company to carry it to Sharon. The ore was to cost $8.20 per ton and was to be paid for and shipped according to a detailed agreement which it is unnecessary to state here.

The iron company shipped the ore and landed it at Erie at the dock in charge of the Railroad Company. The Westerman Company paid for the whole contract of 2,000 tons, and began to take away the ore. It seems that the iron company had other buyers in Erie, and had shipped a much larger quantity than 2,000 to Erie where the ore lay unseparated in bulk. They, however, gave notice to the Railroad Company, that 2,000 tons of the ore shipped belonged to the Westerman Company. As the ore was all of the same grade, all the Westerman Company had to do was to take away their 2,000 tons of the bulk.

However, when the ore at Sharon was weighed there was found to be a shortage of 300 tons of ore. Some time later they made a demand on the Cliff people for their value of the shortage, but were refused on the ground that having delivered the entire 2,000 tons at Erie, the title passed to the Westerman's, and if anything happened to the ore afterwards, they could not be held responsible.

It appears that at that time it was the custom to deliver ore in bulk when it was of the same kind and grade, and to permit the buyer to take away the amount of his purchase. This the mining company did, and they claimed that it was not their fault that the entire 2,000 tons were not delivered to Sharon.

The case come up in the Circuit Court first, where the Westerman Company was given a verdict for their value of the shortage. The case was then appealed to the Supreme Court of Michigan where it was held that the ore after it was delivered at Erie, became the property of the Westerman Company because everything incumbent upon the seller had been performed. He had agreed to mine and ship the ore to a certain place, and therefore as soon as that place was reached the ore belonged to the buyer, and the seller was no longer concerned with what happened to it. The Westerman's raised the question in regard to the ore not having been separated from the bulk and set apart for them ready to be carried away. The Court held that this objection could not prevail because the custom of the trade of that particular business must be taken into consideration, and according to that custom or usage it had been proven in this case that it was the custom for shippers to deliver ore in bulk and to permit each buyer to take away his share, providing of course, the ore was all of the same kind and grade.

Upon this decision the Westerman Company lost its case, their only remedy being against the transportation company which had failed to deliver the 300 tons of ore from Erie to Sharon.

Opening of American Products Abroad.

NEARLY everything in the United States could be sold in the Reichenberg district, but the greatest opportunity of all is for spinning and weaving machinery. In previous reports, I have noted the absence of American machinery in Bohemia. Of the approximately 2,000,000 flax, wool, and cotton spindles and of the many thousand looms operating in this district, not one was made in the United States, writes Frank W. Mahin, U. S. Consul at Reichenberg, Bohemia. During the past summer, a firm at Dresden, Germany, advertised American farm machinery in a Reichenberg newspaper. Soon thereafter, and possibly as a result thereof, I saw an American mower at work in a neighboring meadow—the first and only American machine I have seen in this district. But it is an entering wedge, and inspires hope for the future.

In Southern France, the importation of American coal has passed the experimental stage; and, notwithstanding the nearness of English, Belgian, and German coal fields, American coal has begun to filter into Northern France at different points. Two weeks ago, for the first time in the history of this port, a vessel direct from Philadelphia unloaded a cargo on the Rouen quays. If this infiltration is successfully begun with the employment of foreign shipping, it can only be a matter of time when the United States, with her own vessels, will supply most, if not all, of the French deficiency. France consumes annually about 45,500,000 tons of coal, of which she produces nearly 75 per cent. Of the 45,228,000 tons consumed in 1899, 13,370,000 tons came from abroad.

Consul-General Bray reports from Melbourne, that one of the most valuable cargoes ever carried to Australia has just arrived there from Brooklyn. It includes twenty-four locomotives built by the Baldwin Locomotive Works for the government of New South Wales, some 4,000 tons of miscellaneous manufactured goods shipped by various commission houses doing business with Australia, and about 700 tons of paper. The cargo amounts to nearly 10,000 tons, and is valued at over $1,000,000.

THE STEAM ENGINE INDICATOR.
IN LOCOMOTIVE PRACTICE.

BY ROY V. WRIGHT, Mech. Eng., P. & L. E. R. R.

THE steam engine indicator has been developed and improved until one acquainted with it in its original form would not recognize it in its present state. Possibly one of the reasons why it has reached its present high state of development is the fact that, as it became more and more used on locomotives, it was necessary to bring it to a high state of efficiency in order h .it could be successfully handled by a man perched out on the steam chest, and rushed along at the rate of seventy or eighty miles an hour, or what is probably worse, traveling at the rate of thirty miles an hour on one of our newer lines. Certain it is, that its value as a means of studying the steam distribution in the locomotive and the problems involved therewith, and of thus being instrumental in bringing the locomotive to its present high state of efficiency, cannot be over-estimated.

Probably the chief reason why it has not been more widely used is the fact that the men in authority have not had the time to look into the advantages to be gained by its use, or if they have, had not the time to use it.

Nothing has done so much for the upbuilding and perfecting of the stationary engine as the use of the indicator. It is the practice among leading builders to indicate every engine before it leaves their works, in order to make sure that it is in proper condition. They consider the indicator as an indispensible instrument to their business.

Who ever heard of a locomotive builder indicating a locomotive before it left the works unless it was particularly specified, and how many times is it thus specified? Have we reached a higher state of efficiency in locomotive building than has the stationary engine builder, or, is it because the problem of steam distribution is more simple in the locomotive? Is the stationary engine so much more important, or costly, or is a saving of fuel, or an increase of efficiency in it of more importance than in the locomotive? How often do we find a stationary engine that is not plugged for an indicator connection, and on the other hand, considering our railroads as a whole, how many of the locomotives do we find plugged for indicator connection, and of these, how many have but one cylinder plugged?

It has been said that it requires more time and expense to indicate a locomotive, but is not the additional expense justified when we consider the relative value and possible savings to be made in the two classes of engines? We have the steam gauge, the water glass and the gauge cocks to let us know what is going on inside the boiler, The air gauge shows whether the air is doing what it should. Likewise, the steam engine indicator shows what is going on in the cylinders. Of all the perplexing problems that come before the motive power department, that of the steam distribution in the locomotive is one of the most important, and to get the best results, we should know just what the steam is doing after it leaves the boiler and passes into the steam chest and cylinders, and out through the stack. It is true we get some idea of the efficiency of the locomotive by the way it gets the trains over the road; but we are not sure that it is doing its best, or that it cannot be improved, unless we know exactly what is going on in its cylinders. We are continually changing the designs of our locomotives in order to improve their efficiency, or to meet changed conditions. Some roads draw up these designs in their own drafting room, while others have the builder design them to meet local conditions. As these locomotives go out into service and are experimented with it is usually found necessary to make some changes in the design to get the best results. Sometimes the heating surface or grate area is not quite right; sometimes it is the arrangement of the front end, and sometimes something else. How many of our roads examine carefully into the steam distribution by means of the indicator to see if it can be improved upon? Have we grown so proficient in designing the valve gear, cylinders, etc., that a mistake cannot be made in them as in the other parts? Cases have been known where the

mechanical department has studied long and hard to find out what was wrong with a locomotive, and then when the indicator was appealed to, as a last resort, it was easily solved.

It has also been a great value in developing and showing forth the advantages and disadvantages of the various types of locomotives which have been inrtoduced. This is particularly true of the various compound engines and of locomotives fitted with the piston valve. It has also demonstrated clearly the value of certain valves, valve gear, etc.

It is not only on new locomotives that the indicator should be used. Conditions in railroad operations and management have changed very materially during the past few years. Business has increased greatly in volume and competition has also increased. Costs are now worked out on the ton mile basis, and the system of engine ratings has been introduced. It is essential that every piece of equipment be kept at its highest point of efficiency and that it be worked up to its full capacity. We cannot afford to have a locomotive pull only 2450 tons of freight over the road, if it is capable of pulling 2,500 tons. Neither can we afford to have a passenger train losing time on the road if it is possible to prevent it.

The old locomotives have had to met these new conditions. Working them up to their limit it has often been found that they cannot do the work that they should do on account of defects. The use of the indicator is of great value in locating these defects, and as an aid in re-designing these locomotives to be better able to meet the new conditions.

The indicator should be used as an aid in setting the valves. The conditions when the locomotive is in service and running at its usual cut-off and speed are entirely different from what might have been expected when the valves were set in the shop. This difference is due to vibration of the valve gear, and in some instances springy valve gear, etc. The setting of the valves should be checked by the use of the indicator to see that they are right for the usual running condition.

The indicator does not tell you in so many words that the steam passages are too small; that the valve gear is out of order, or that the valves are badly designed, or that something else is wrong. It simply records exactly what is going on in the cylinder, provibed the proper precautions have been taken in setting up the indicator and taking the card. It shows the exact pressure in the cylinder at each part of the stroke. The different events of the stroke can be located by the lines on the diagram. Experience and a study of these cards teach us where these points should be located in order to gain the best results under different conditions. If the card, therefore shows these events where they should not be, or if the card is distorted, or if the diargam for one end of the cylinder differs from that of the other end, or if the cards for the two engines differ, then we know that something is wrong, and the question is to locate it. With a little study and experience the difficulty can usually be easily located, but it very often happens, where the defects are complicated, that considerable study and some experimenting are necesasry before the problem can be completely solved. If there is anything wrong with the steam distribution the indicator will show it.

While the indicator card from a locomotive is, in general, the same as that from the stationary engine yet it presents many differences. So far as the writer knows there is no treatise which treats of the application of the indicator to the locomotive and enters into the study of the locomotive indicator diagram and covers the subject fully. Probably the most complete article on the subject is a committee report made to the Traveling Engineers' Association in 1900.

At various times, however, during the past few years, papers or reports have been presented before our railway associations or clubs, and articles have appeared in our railway technical papers which have treated of different phases of this sujbect, and have contained valuable information to one interested in this work. Also, as different types of locomotive or different appliances which affect the steam distribution having been tested, indicator cards have been taken, and from time to time some of those which were of particular interest because they showed up good or bad points in the locomotives, have been published.

Drawings for French Patents.

CONSUL-GENERAL GOWDY, of Paris, reports that the French Minister of Commerce has issued a decree dated September 3, 1901, to come into force on January 1, 1902, which reads (translated) as follows:

Article 1—Specifications for patents and certificates of addition, in conformity with article six of the law of July 5, 1844, shall be correctly written in ink or printed in good and legible characters upon paper having a uniform size of 33 centimeters by 21 centimeters (12.992 inches by 8.268 inches), with a margin of four centimeters (1.575 inches). The original copy shall be written or printed on one side of the sheet only. No drawings shall appear in text nor in the margin of specifications.

Article 2—Drawings shall be made on sheets of paper having the following sizes: Thirty three by 21 centimeters (12.992 by 8.268 inches) or 33 by 42 centimeters (12.992 by 16.536 inches), with an inside border line of two centimeters (0.787 inch) in such manner that the drawing shall be comprised within a border line of 29 by 17 centimeters (11.417 by 6.692 inches) or 29 by 38 centimeters (11.417 by 14.961 inches). This border line shall be constituted by a single line having a thickness of about one-half of one millimeter (0.02 inch). In case it should be impossible to illustrate the patented article by means of figures, inclosed within a border line of 29 by 38 centimeters (11.417 inches by 14.961 inches), the inventor shall be at liberty to subdivide one figure into several portions, of which each shall be drawn upon a sheet having the above-indicated size. The section line of figures shall be indicated by letters of reference. The figures shall be numbered without interruption from the first to the last by means of Arab numerals. If the sheets be numbered, the numbers shall appear outside of the border line. The original drawing shall be executed in ink, with regular and perfectly black lines, upon bristol board or other white paper, thick and smooth, allowing of reproduction by photographic process. No tint, shades, or wash shall appear therein; if necessary, these shall be replaced by regular and properly spaced cross lines. The duplicate drawing shall be on cloth or paper, and may be colored. The drawings shall be made of a sufficient size, without exaggeration, so that it shall be possible to ascertain exactly the article to be patented from a reproduction reduced to two-thirds the size of the drawings. The scale indicated shall be according to the metrical system. The drawings shall not contain any descriptive matter or indication other than the numbers of the figures and the letters (capital or small or numerals of reference, the height of which shall be from three to eight millimeters (0.118 to 0.315 inch. None but French characters shall be used. Any descriptive matter considered indispensable by inventors for the comprehension of their drawings shall be inserted by them in the body of their specification. The signature of the inventor or his attorney shall be written outside the order line. The drawings shall not be folded; they shall be handed in at the time of filing, either flat or rolled, so as to be free from folds or creases.

ARTICLE 3—No wood engravings of the invention shall be received or illustrations other than drawings prepared as above described, unless they be of a nature suitable for reproduction by some process based upon photography.

ARTICLE 4—The present rules shall apply to applications for patent, the filing of which shall take place from January 1, 1902.

ARTICLE 5—Until July 1, 1902, and merely as an essentially provisional measure, specifications and drawings which are not prepared according to the requirements contained in the present decree shall be returned to the inventor with a request that he shall furnish new and formal documents within one month. A copy kept at the National Patent and Trade-Marks Office shall serve to establish conformity between the documents successively filed. Should the applicant not comply with the above-mentioned request within the appointed time, the application shall be rejected in accordance with article 12 of the law of July 5, 1844. In case of justified necessity the delay granted to the inventor may be increased on his request.

ARTICLE 6—The director of the National Patent and Trade-Marks Office is entrusted with the execution of the present decree.

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Iron and Steel Prices Will Advance.

ALL indications point to an advance in iron and steel prices. This will not affect contracts already let. It is said that the production for the next ten months is contracted for. Manufacturers and consumers have evidently seen the handwriting on the wall of prosperity and have acted wisely in ordering early. The small consumer, however, who buys from day to day will have to pay higher prices. An advance on all manufactured products of iron and steel will take place as soon as the prices of raw material are shoved up. The early buyer will not let the opportunity slip by.

The advance of coke 50 cents a ton will have the effect of forcing pig iron a notch higher. Castings will be advanced because foundry coke will cost more. It is expected that wages will also have to be advanced this year. The Amalgamated Association will demand higher wages as will the coal miners. Wages of coke workers will remain stationary. The railroads are so blocked with freight traffic that a further advance in freight rates might reasonably be expected. It may not be much but enough to unsettle conditions.

Word received from many of the machine and foundry concerns throughout the country indicates that they are filled up with orders to the brim and many are refusing further business. This indicates that those entering the market later in the year will have to pay higher prices than now exist. The machinists may also ask for concessions this year, although the loss of the machinists' strike last year crippled the organization. Individual firms may be forced to raise wages to hold good men as there is a strong demand for first class mechanics and changes are frequently being made. The machine builders will rather advance wages than shorten working hours as output is the essential during this rushing period.

Railroad Building Exceeds Manufacture of Supplies.

SUCH a small thing as a famine in railroad spikes threatens to bring railroad building to a standstill. The spike makers of the country have not kept pace with railroad building in the erection of plants and as a result are four months behind in their orders. The rapidity with which orders for railroad material is piling up threatens to create a further shortage and the spike mills will soon be six months behind in orders.

The building of bridges and boilers has almost caused a similar shortage in rivets and the bolt and nut factories were never so busy as at present. New spike making plants are projected as a result of the increased demand and a contract is being let in Pittsburg for a $250,000 plant for making spikes. The rivet plants are in better shape as several new works were set in operation last year.

Several new steel car concerns are being organized to relieve the strain on that industry. It will be some time before these new plants can be placed in operation. The new works will be well supplied with work as the country is growing large enough to keep many additional factories busy.

Recent Boiler Explosions.

PITTSBURG has had more than its share of boiler explosions recently. It means one of three things. Pittsburg manufacturers are working with worn out machinery: employ ignorant attendants; or they are rushing their plants to such a capacity as to overwork them. All the old theories relating to the sudden expansion of steam and hot water due to the feeding of cold water into an empty boiler causing an explosion have been discarded. It is being accepted more and more that the sudden cooling of a boiler by the influx of cold water will not cause an explosion except under certain conditions.

Some time ago an employe of a Pittsburg concern sought to impress this fact on his employers. He was allowed to empty a boiler, heat it red hot and turn on the cold water while he sat on top of the boiler, the others being at a safe distance expecting to see him raised skyward. But he was not. His theory was that if all the valves, rivets, seams and openings in the boilers were tight the sudden expansion of the cold water which suddenly became heated, would not cause an explosion as the water and steam could not expand enough. By suddenly taking one-half of the boiler off the steam would rise in a cloud and much of the water would rise in the air, provided the atmosphere was not too cold, suddenly evaporating the steam and hot water. But should an opening the size of an ordinary lead pencil exist in the boiler just as the cold water struck the heated sheet, so sure would the boiler be rent asunder. He alleged that many of the valves and boiler fittings around where he worked were not tight. Just as the water touched the heated plate causing a revulsion within the boiler the hot water would rush in that direction.

The pounding in steam boilers is due to this escape of steam or hot water through leaky joints, valves, or holes whereas, if the steam and hot water were confined tightly within a cylinder it could not rush towards the outlet creating the noise en passage.

Fuel Oil a Success.

THE burning of oil for fuel has passed the experimental stage. Railroads, mines and sugar plantations are using the new fuel in the Southwest and steamers are plying the oceans with nothing but liquid for motive power. There are still a few engineers who maintain that oil cannot be burned in competition with bituminous coal, but the fact remains that it is being done and that successfully.

The heavy oils found in Texas are destined to cheapen fuel in the Southeastern section of the United States. Large quantities are being shipped along the coast. The leading oil producers are preparing to refine the Texas product which will increase its value and take a large quantity out of the fuel market. In spite of the favorable reports concerning the use of oil as fuel, consumers are slow to adopt it on account of the expense of changing furnaces, etc.

The directors of the proposed World's fair, St. Louis, are advertising the merits of oil as fuel by making every effort to use it to produce power for the exposition. The main object sought is to solve the smoke problem. If the promoters of the enterprise can find economical methods for using oil during the exposition and while the buildings are being erected, it will be a great card for the oil producers. It is doubtful if oil can be used in competition with bituminous coal at St. Louis as transportation charges on oil will be too high. If oil carrying barges were built to run between Galveston and other points near the oil fields to St. Louis the freight problem might be solved.

IN AND ABOUT PITTSBURG.

During the week charters were issued at Harrisburg to the following concerns: Standard Connecting Rod Company, Beaver Falls. capital, $30,000; Pittsburg & Brady's Bend Railroad Company, to build seven miles of road in Clarion, Armstrong and Butler counties, capital, $70,000. President, Edward Wilkins Dewey, New York. The following interests have made increase in capital as noted: Pittsburg Seamless Tube Company, Pittsburg, $1,000 to $500,000; American Railway Tie & Girder Company, Pittsburg, $1,000 to $25,000; Hockensmith Wheel & Mine Car Company, Irwin, $1,000 to $75,000; Encaustiue Metal Interior Company, McKeesport, $20,000 to $100,000; Eagle Foundry & Machine Company, Allegheny, $10,000 to $50,000; A. R. Budd Coal Company, Pittsburg, $160,000 to $250,000; Floyd Manufacturing Company, Pittsburg, $1,000 to $75,000: Shenango Furnace Company, Allegheny county, $120,000 to $600,000: the Vesta Coal Company, Pittsburg, $1,522,000 to $2,500,000.

Work will be begun next week on the opening of the first of a number of mines to be opened and operated in this district by the National Mining Company, a constituent company of the United States Steel Corporation. The company has opened offices at 815 and 816 Empire building, this city, in charge of F. A. McDonald as chief engineer, formerly assistant chief engineer of the Pittsburg Coal Company. The operation of the company will be confined for the present to a 7,500 acre tract of coal land in the Pan-Handle district, about 14 miles from Pittsburg. The contract for the equipment of the first mine has been practically closed. The capacity of the mine will be from 2,000 to 3,000 tons per day. The constituent companies of the United States Steel Corporation control many hundreds of acres of coal land, which will eventually be developed by the National Mining Company.

Howard Swarer, secretary of the Wisconsin Graphite Company, of this city and E. W. Sellers, general manager of the company, closed a deal at Milwaukee, December 28, for the lease of the car shops of the railroad company at Stevens Point, recently abandoned. The shops will be used by the Pittsburg company for the grinding of graphite from the bed of the company at Junction City. The company has secured a big bed 15 feet wide and 100 rods long, which is among the most valuable in the country. The car shops will be fitted with machinery for grinding and drying the graphite and an additional engine house erected.

A consolidation of the interests of the Vulcan Manufacturing Company, Homewood, and the Fullman Company, Imperial power building this city, has been effected. The consolidated company will apply for a charter as the Fullman Company. The seventh floor of the Imperial power building is being fitted up for the purpose of carrying on the business of engineering, designing, electrical work, instrument making, machinists' tool making, pattern making and blacksmithing. Simon A. Stupakoff, of the Vulcan Manufacturing Company, is a well known mechanical engineer. while Mr. Fullman is equally well known in the electrical engineering field.

A charter was granted at Harrisburg a few days go to the Standard Steel Car Company, of Pittsburg. The incorporators are three men formerly identified with the Pressed Steel Car Company— J. M. Hansen, as chief engineer; H. J. Gearhart, auditor and assistant to the general manager; and Peter F. McCool, manager of the McKee's Rocks plant of the company. When the incorporators of the Standard Steel Car Company applied for a charter the capital was placed at $2,000,000. Later the amount was increased to $3,000,000. No site for the new plant has been chosen.

The Dowerman Rivet & Bolt Manufacturing Company, of this city, has been organized by William F. Dowerman, W. S. Evans, and John Emmel, Jr., and will apply for a charter with $10,000 capital stock. The company has secured the building at Thirty-second street and Penn avenue. Boiler and structural rivets of Bessemer and open-hearth steel and refined iron will be the product of the company at the start and later forging and bolt departments will be added. The plant will be in operation by the middle of February.

A charter will be applied for January 18 by the Pittsburg Rubber & Leather Company, of this city. The company will manufacture and sell at wholesale and retail all kinds of belting and rubber goods. The company is composed of W. B. Miller, W. C. Rae, S. D. Rae, J. W. Paul and A. R. Paul. The products of the Diamond Rubber Company, Akron, O., and the Charles Munson Belting Company, Chicago, Ill., will be handled at the headquarters of the company, 10 Wood street, this city.

The Keystone Foundry Company, Uniontown, Pa., contemplates the erection of an addition to its plant to double the present capacity. The company recently began operations in a plant 70 by 150 feet which is fully employed in making

car castings. The 70 by 150 foot addition to be built will be used for the manufacture of radiators. The company is composed of C. W. Howell and Robert McDowell.

William Glyde Wilkins, civil and consulting engineer, this city, has awarded contracts for part of the $300,000 improvements to the No. 3 plant of the Hecla Coke Company, Mt. Pleasant township, Pa. Patterson & McNeil, Washington, Pa., were awarded the contract for a 12 x 26 foot main shaft and a 12x18 foot air shaft to the mine. The Vulcan Machine Company, Wilkesbarre, Pa., will install two 24x48 inch hoisting engines.

The Le Roy Instrument Company will apply for a charter February to manufacture surgical instruments, physicians and hospital supplies. The incorporators are: Howard O. Anderson, Harry Mann and Charles Le Roy. A manufacturing plant will be equipped in the Pittsburg district.

The Bradley Manufacturing Company, of this city, recently organized by C. H. Bradley, Jr., Daniel J. Geary and others, will let the contract for its new building this week. As before stated the plant will be located on Preble avenue, Allegheny, and will be complete in every respect. The company will not build a foundry department at present but will secure its castings from outside concerns.

Charles T. Schoen, and his agents in Pittsburg are doing a great deal of quiet work preparing for the founding of a plant for the manufacture of steel car wheels, after a patent by Mr. Schoen. The contract for the machinery has been awarded, most of the work going to the Bethlehem Iron & Steel Company. A Pittsburg site will be selected shortly.

Application will be made January 14 for a charter by the Pittsburg & Washington County Coal Company. The company has extensive holdings of coal lands in this district and will immediately develop them. The incorporators are William M. Hall, Jr., Watson B. Adair, and William M. Robinson.

The Atlas Coke Company, of Pittsburg, has bought the plant of the Lafayette Coal & Coke Company, of Uniontown, for $385,000. The property is on the Redstone branch of the Pittsburg, Virginia & Charleston Railroad and embraces 375 acres of coal land, with 163 acres of surface and 111 ovens.

The Keystone Driller Company, of Beaver Falls, Pa., has just completed the erection of two buildings each 40x200 feet. The machinery for the manufacture of portable machines has also been installed and operations in the new buildings will begin shortly.

The new plant of the National Foundry and Supply Company, at New Stanton, Pa., was placed in operation last week. The company has eight acres of ground with three buildings, two of which are used for a foundry, while the other is used as a machine shop. The former plant of the company at Greensburg has been abandoned and an increased capacity of 75 per cent is gained in the new plant. Further improvements are contemplated. The main office of the company is located in the First National bank building, this city. A. H. Lang is secretary and treasurer.

The Riter-Conley Manufacturing Company has the contract for the steel buildings, storage tanks and other work for a large oil refinery, which the J. M. Guffey Petroleum Company is to build at Port Arthur, Texas. The plant when completed is expected to cost about $1,000,000.

Application for a charter was made by the Naomi Coal Company, of Pittsburg, January 8 1902. The company is composed of C. L. Taylor, J. R. McCreery, A. M. O'Brien, W. B. Rodgers and R. P. Nevin, Jr. The company is to mine coal and manufacture coke.

The H. K. Porter Company, of this city, has just shipped to South Africa two locomotives for use in coal mines near Johannesburg. Two similar engines are to be shipped for the same purpose about the end of this month.

The Mesta Machine Company, this city, has completed a shipment to the Colonial Steel Company consisting of three 30x60 Corliss engines with 60 ton flywheels, two 18-inch rod trains, one 22-inch rod train, and one 28-inch rod train.

The Damascus Bronze Company, Allegheny, is adding to its equipment and preparing to increase its capacity 50 per cent. New furnaces are being built, a tramway added, and several other improved devices.

Charles R. Fleming, president of the Consolidated Old Mountain Mining Company, of Arizona, is in Pittsburg to place orders for mining machinery, equipment, pipe, wire, and electrical supplies to the amount of $260,000.

The Green Consolidated Copper Company, of Mexico and Arizona, will install a 240 ton White briquetting plant at its Arizona furnaces. The order was placed with the Henry S. Mould Company, of this city.

The Steubenville Traction Company, Steubenville, O., has placed an order with the local representative of the Crocker-Wheeler Company, for 300 k. w. engine-type, generator.

The new plant of the Railway Spring Manufacturing Company, Washington, is almost completed and will be ready for operations in a short time.

NOTES OF THE INDUSTRIES.

The Atlas Engine Works, Indianapolis, Ind., has just completed and put in operation a new boiler shop, 70 x 900 feet, with wing 60 x 365 feet, equipped with independent power house, etc.; a new forge shop, 50 x 205 feet, and a new machine foundry, 70x300 feet. A heavy casting foundry, 120x500 feet, is nearly complete. The walls are half up for a new machine shop, 50x322 feet, three stories. Plans are prepared for a new central power station and a central melting plant. The new buildings and equipment will involve an expenditure of about $700,000.

It is reported that a deal for 300 acres of land on the river bottoms on the West Virginia side, opposite Steubenville, O., which has been under option by Chicago parties, has been closed for a big price. The land is adjacent to the proposed line of the Wabash Railroad and is wanted for a big car works.

The Akron Salt Company, Akron, O., will soon be organized by E. A. Bowman and others who will duild a salt works near that place. The company will soon be in the market for a complete power plant to include 10 150-horse-power boilers, engine, and other machinery. A large amount of pipe ranging from 2 up to 12 and 14 inches will also be wanted.

The P. B. Broughton brick works, which were recently destroyed by fire at Lewis Run, near Bradford, Pa., entailing a loss estimated at $30,000, will be re-built in the spring. P. B. Broughton is arranging to begin the construction work on the new plant at the earliest possible opportunity and plans and specifications for the proposed structure are being prepared.

The Pennsylvania Fire Brick Company, Beech Creek, Pa., advises us that it has just completed an addition to its yard, making 275 x 80 feet of floor space and doubling the former capacity. The new addition was necessitated by the rush of orders in excess of the capacity and even with the present facilities the company is taxed to the utmost to supply the demand.

The Lidgerwood Manufacturing Company, of New York, has made a contract with the Eastern Shipbuilding Company, of New London, Conn., to install eighty winches on the two Pacific liners now under construction at those yards. The winches range in capacity from 3,000 to 14,000 pounds and are to be operated by electricity.

The Brookfield Glass Company, of Brooklyn, N. Y., is negotiating for the purchase of the plant of the Cohansey Glass Manufacturing Company, Bridgeton, N. J. The Brooklyn concern must give up its present location at the end of this year, and is anxious to locate in Bridgeton.

The building of the plant of the Ohio Manufacturing & Galvanizing Company, at Niles, O., is moving right along and it is expected the new industry will be in operation in a reasonable length of time. None of the machinery has been installed, although it will be just as soon as preparations can be completed.

The Bullock Electric Manufacturing Company has secured a contract for an 800 kilowatt generator for the Union Traction Company, of Philadelphia, to develop 1,000 horse-power. This is the first generator placed with the traction company, but there is a conditional order for a second machine.

The American Hoist & Derrick Company, of St. Paul, Minn., will supply the large derrick plant which the Atlantic, Gulf & Pacific Company, of New York, will use in the execution of important harbor work for the United States government at Manila.

The McCormick Harvesting Machine Company, Chicago, Ill., has begun the construction of a five story addition to the works on Leavitt street. The new building will cost about $40,000, and will be the third addition to the works since July last.

New Philadelphia, O., is to have an ice plant, and it is to be built by Cambridge investors. It is stated that Charles E. Roden, cashier of the First National bank, of Newcomerstown, will be manager of the plant.

The Nagasaki Electric Light Company, of Nagasaki, Japan, has placed an order for a 300-horse-power boiler equipment, to be manufactured by the Aultman & Taylor Company, of Mansfield, O.

Reports are that a woolen mill is to be established at Bradford, Pa. Mr. W. Calhoun, representing a concern of Troy, Pa., is placing the matter before the Board of Trade, Bradford.

The Ingersoll-Sergeant Drill Company, of New York, is about to ship something like a hundred tons of air compressors to Batoum on the Caspian, for use in the Baku petroleum fields.

The Landis Tool Company, of Waynesboro, has nearly completed its No. 25 Universal grinder. The machine is about 21 feet long, weighing about 30,000 pounds.

It is rumored that the Atlanta, Ind., works of the American Tin Plate Company are to be dismantled and the mills removed to Elwood, Ind.

IRON AND STEEL TRADE,

PRICES AND CONDITIONS.

PITTSBURG—The iron and steel industries and their allied interests are still waiting upon the transportation companies. There are promises in plenty and some sign of action with relief for the metal industries as an object but there has been nothing tangible so far. The railroads have made some changes in the personnel of their terminal officers and there are prospects of amendments in customs as to charges on cars but it is not quite clear how the shifts in officers and changes of charges customs will compensate for a flagrant shortage in motive power. Some display has been made of the advances in wages given to the railroad employes on the ground that the higher wages will increase efficiency of the service. If this is to be taken seriously, and the statement was made in all seriousness, it means that the railroad companies propose to continue to shift the burden of their responsibilities in every possible fashion rather than get at the trouble in the right way. How the railroad companies expect to improve the efficiency of the service by advancing the low wages of men already overworked is a problem that none but a railroad official can solve. There is a limit to human endurance physically and it has been exceeded by the railroads in relation to their employes and if the railroads expect to gain anything by adding to the overworked men's burden they are in line for some lessons that will make plain a number of things not well understood at present by everybody.

The whole situation still continues to depend upon the question of transportation. The mills are working along as best they can but the best is poor. The demand for material of all classes is extending and the urgency of consumers is becoming more marked each day. In particular structural and plates and rails are in demand for prompt consumption but the mills have been compelled to surrender to cir mstances. It is out of the question to make anything aproaching prompt deliveries in any material.

Pig iron is coming into its own and even if the congestion is relieved it is quite certain that the values of pig iron will advance to a higher level. This week another advance of 25 cents was made for Bessemer and 8,000 tons were sold for $16.00 and $16.25, at valley furnace, bringing the highest mark up to $17.00 at Pittsburg. Billets continue easy but it is impossible to secure larg lots. The former nominal quotation of $27.50 and $28.00 prevails.

CURRENT QUOTATIONS:

Basic	$16 25	16 50	Splice bars	1 50	
Bessemer	16 75	17 00	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		16 75	Z beams	1 60	
Fdy 2, Nhn		16 50	Channels	1 60	
Fdy 3, Nhn		15 75	Boiler plates	1 75	
Mill Iron	15 25	15 75	Fire-box	1 85	
Fdy 1, Shn	16 65		Sheared	1 65	1 75
Fdy 2, Shn	16 40		Tank	1 69	1 70
Fdy 3, Shn	15 65		Steel melt'g scrap	14 00	
Grey Forge, Shn.	15 10		No. 1 wrought	15 50	
Bessemer billets	27 50	28 00	No. 1 cast	18 00	18 25
Open hearth	29 00	30 00	Iron rails	21 50	
Steel bars	1 60		Car wheels	17 50	18 00
Iron bars, refined.		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Bolts, iron, sq nut.	2 50		Sheets, 26	3 00	
Hex nuts	2 65		Sheets, 27	3 10	
Standard sections.	28 00		Sheets, 28	3 20	
Spikes	2 00				

PHILADELPHIA—The exceptional activity and strength of months still prevails in all the markets. The customary dullness at this season has been waived in the eagerness of consumers to get deliveries and their anxiety is shared by the producers who are just as eager to get out of the way the tonnage which belongs to the old year.

The pig iron movement naturally is as active as it is possible for any one department to be. Consumers are not taking any risks on the improvement promised for the future and are snapping up all the pig iron they get sight of even at the advanced prices prevailing. The principal grades of pig iron are practically $1 per ton higher than two weeks ago but buying is actually stronger than at that time.

Billets are in greater demand as the rush on finished steel is increased and although the supply is slightly easier the prices are at the the highest notch, $29 to $31 per ton at mill. Not much raw steel is passing at that figure but the principal reason is that there is only limited sized lots to be delivered at any price.

The finished products continue to be hampered by the delinquency of the transportation companies in spite of promised and claimed improvements. The mills are unable to get stocks moved promptly either way, from or to the furnaces and plants, although in this respect the East is said to be much better provided for than the West and Central Western section.

CURRENT QUOTATIONS:

Foundry, 1	$16 25	16 50	Girder rails	32 00	32 50
Foundry, 2	15 75	16 25	Angles, 3" & lr'gr	1 75	1 80
Gray Forge	14 50	14 75	Under 3-inch	1 85	1 90
Bessemer billets	29 00	30 00	T's 3" and larger	1 80	1 85
Open h'rth bil'ts	30 00	31 00	Under 3-inch	1 85	1 90
Steel bars	1 70	1 80	Heavy plates	1 75	1 80
Refined iron bars	1 65	1 75	Beams and chanls	1 75	1 85
Standard rails	28 00				

NEW YORK—The transportation problem, which is the pivot around which the whole situation revolves today, has not improved during the week. Some well informed railroad men take a more hopeful view of the future, however, than they did a week ago. Wage advances of railroad employes, which are going into effect, are expected to increase the efficiency of service. Plans are under discussion also by railway officials for the re-adjustment of payment for cars from the mileage to a per diem basis. There are difficulties in the way of accomplishment of this reform, but, if effected, it is believed it would add ten per cent instantly to the efficiency of the rolling stock of the country.

Some railroads profess to have gotten better control of their service, but the effect is not yet appreciably felt. It is difficult to arrive at the extent of the curtailment of blast furnace operations by the fuel famine, but it is believed to be not less than 20 per cent, and in some districts it is much more. The problem of interest is as to whether mills and foundries are proportionately curtailed so as to preserve the previous balance between production and consumption. The best information is that they are not, and the scarcity of pig iron will be keenlv felt through the first quarter of the year.

Three has been more than the usual holiday demoralization among labor, particularly in the South. Between the extreme cold weather and the independence of negro labor through the urgency of demand for labor at full wages, most of the mines, furnaces and mills of the South came practically to a stand-still during the holiday week.

Southern irons have moved up another 50 cents during the week. Bessemer pig for forward deliveries has gone to $16.00 at Valley furnaces, and much higher for any available spot iron. The general market is firm at 50 cents higher than on Christmas day. Further advances seem almost inevitable although there seems to be a sincere purpose on the part of manufacturers to avoid them.

CURRENT QUOTATIONS:

No. IX fdy Nohn Jersey City	$16 15	16 40
No. 2X fdy Jersey City	15 65	16 15
No. 2 plain Jer. C.	15 15	15 65
Sohn. 1 fdy N. Y.	16 25	16 50
No. 2 fdy N. Y.	15 50	16 00
No. 3 fdy N. Y.	14 75	15 50
No. 1 soft	16 00	16 25
No. 2 soft	15 25	15 50
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40
Sheets, blue annealed, 10	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00
Plates ¼ and heav	3 15	
Angles	2 00	2 50
Tees	2 00	2 50
Zees	2 00	2 50
Time deliveries, basis $1.75 for angles, beams and channels.		
Com. base, bars per 100 lbs	1 85	1 90
Refined base, bars	1 90	2 00
Bands, base	2 40	2 50
Norway bars	3 75	
Norway shapes	4 25	
Old T rails, iron f. o. b. cars	19 00	20 00
T rails steel f o b c	16 00	17 00
No. 1 wro't scrap iron f o b cars	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes	13 00	14 00
Old car wheels, f. o. b. cars	16 00	17 00
Old ham. car axl's f. o. b. cars	22 00	23 00
Wrought turnings deliv. at mill	9 00	10 00
Ship & tank plate, on dock	2 50	2 50
Sheets, galvan. ex store N. Y.	70 & 5	to 70 & 10
Beams and chan'ls 15-in & under	2 00	2 50

CINCINNATI—The new year opened well for the iron trade. and the promise is for a record to exceed any one year of the past. There is a great press of business and all kinds and grades of iron have been sold. No. 3 foundry has been remarkable, having been bought bv a number of mills, owing to inability to get other grades that they preferred. If one asks for spot iron, he recives an answer intended to squelch. It cannot be had. Orders are taken for delivery any time before 1903 with reply that delivery may be made during the last quarter of this year. Large producers have advanced their prices throughout all districts. This was unavoidable. The demand for finished iron and steel seems to increase in volume as well as in urgency for deliveries.

In structural material the demand is on the steady increase. More large buildings will be erected here this year than ever before in one year. The H. & S. Pogue Company's building, at Fourth and Race streets, will be eight stories high of steel skeleton construction, and will require a large tonnage.

The steel rail trade continues to be active—even frisky. The current price remains $28.00 per ton. Billets are selling from $4.00 to $5.00 per ton above the price of rails and it is almost a certainty that the price of steel rails will advance beyond the current price, which is only applicable to contracts unfulfilled in 1901 or contracts made early in 1902.

Cast scrap is in good demand, and about 50 cents higher. For steel melting stock consumers are buying sparsely, and the level of quotations is without change.

There is a fair buying of bars, plates, and sheets. Advanced prices on pig iron go into effect this week, and are given below.

CURRENT QUOTATIONS:

South. fdy. 1	14 75	$15 25
South fdy. 2	14 25	14 75
South. fdy. 3	13 75	14 25
South. fdy. 4	13 25	13 75
Grey forge	13 25	13 75
Mottled	13 25	13 50
Shn. 1, soft	15 00	15 25
Shn 2, soft	14 50	14 75
L. Superior, fdy. 1	15 25	15 50
L. Superior, 2	14 75	15 00
L. Sup'r char'l c w	19 00	19 50
Hang'g r'k cel, 1	20 00	20 50
Sohn ccl c w	17 25	17 50
Jaksn cy. silv'y 1	15 50	15 75
St'l brs base hlf ex	1 65	1 90
Iron bars	1 65	1 90
Flange plates	1 82	1 92
Tank steel	1 72	1 82
Ordinary fire-box.	1 92	1 97
T rails	36 00	
Steel hoops	1 95	2 50
Sheet, 26	3 50	
Sheets, 27	3 35	3 85
Sheets, 28	3 45	3 95
Angles, 3 to 6 in	1 75	2 50
Angles, 1¼ to 2½	1 75	2 50
Beams and Chanls 15 in and under	1 75	2 70
I b'ms 18, 20 24 in	1 80	1 50
Tees	1 75	1 85
Z's	1 70	1 80
1 wrought scrap	12 00	13 05
Steel mlting stock gross ton	11 50	
No. 1 cast	11 00	
Old iron rails g t'n	15 00	
Old car wheels	14 50	
Cast borings	5 00	
Turnings	5 50	

CHICAGO—The West seems to accept the serious situation is pig iron without shadow of panic. It is true there is an insistence to present inquiry that is notable, but it might be accounted for by the healthy and strong pulse of trade. But foundry pig iron is becoming an exceedingly rare article in this market. Shippers are now far behind in their deliveries and are daily becoming more and more deeply involved. Extraordinary efforts are being made by the furnacemen to procure the necessary coke to start up idle furnaces or keep in operation those that are now active, and the results are more or less in doubt.

Sufficient to say the end of the trouble is not in sight. Prices have not been changed but the quotations are scarcely more than nominal, except on contracts for future shipments, of which there is now a quite fair trade.

The smaller iron mills are crowded with work and have bookings presaging full activity up to midsummer. The larger producers of both iron and steel bars report conditions similarly good. During the past week inquiries for steel rails have shown a reviving tendency but the prospective buyers receive little consolation, for the mills are not promising shipments before late autumn. Regarding manufactured iron and steel generally the volume of business is eminently satisfactory for the opening week of the year. Prices are without notable change.

One fact that operates against the plan of the consumer of old material to maintain the schedule of prices is that melters from outside district are bidding for the scrap originating in this territory and often with success. There is variance in prices and while they are perhaps not generally higher the tendency is slightly upward.

CURRENT QUOTATIONS:

Bessemer	17 50	18 00	Sheets, 26 store	3 15	3 25
Fdry Nohn 1	16 30	16 25	No. 27	3 25	3 35
Northern 2	15 50	15 75	No. 28	3 35	3 45
Northern 3	15 00	15 25	Angles	1 75	
Southern 1	16 15	16 40	Beams	1 75	
Southern 2	15 65	15 90	Tees	1 80	
Southern 3	15 15	15 40	Zees	1 75	
Forge	14 65	14 90	Channels	1 75	
Charcoal	18 50	19 50	Steel melt'g scrap	13 50	14 00
Billets, Bessemer	30 00	32 00	No. 1 wrought	15 00	15 50
Bars, iron	1 65	1 70	No. 1 cast, net ton	12 00	12 50
Bars, steel	1 65	1 70	Iron rails	21 00	22 00
Rails, standard	28 00		Car wheels	16 00	17 00
Rails, light	31 00	34 00	Cast borings	5 00	5 50
Plates, boiler	1 90	2 00	Turnings	9 50	10 00
Tank	1 75	1 80			

BIRMINGHAM—The Southern pig iron market was never in a stronger position than it is at present. The Sloss-Sheffield Steel & Iron Company has advanced its selling basis to $12 per ton for No. 2 foundry, while the Tennessee Coal, Iron & Railroad Company and the Alabama Consolidated Coal & Iron Company are not far behind. It is any man's market. Spot iron is a difficult thing to obtain. Even with the advance the selling does not fall off; in fact the advance recently made is in the way of defense as much as anything else. The Southern makers of pig iron have very little to offer except for the period after July 1. The steel market is also firm with billets at about $26 per ton. It were difficult to find anything that is untoward. The new year entered with a tendency to advances and the advances have come as the natural consequence of order books well filled at prevailing prices. The prospect does not carry with it any indication of a plethora, but, on the contrary, as Mr. Jean, secretary of the British Iron Trades Association puts it, a continuance for sometime to come of a scarcity of iron. The soil pipe concerns are going through a comparatively dull period, but the water pipe factories are making as much pipe as they did during the palmiest periods of last year. The car famine has been largely dissipated and shipments are very heavy. The tendency in all directions is to substantial enlargements, and improvements, of plants and this bids fair to be the prevailing policy of the year.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 00	12 50	Tank	1 80	
No. 2 fdy, Sohn	11 75	12 00	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 00	11 25	No. 1 wrought	14 00	
Grey forge, Sohn	10 50	10 75	No. 1 cast	12 00	
Billets	26 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	3 10	3 50
Fire box	2 00				

The Metal Markets.

LONDON—Tin £106-£102 10s—Sales, 410 tons spot; 680 tons futures.

Copper—£49 10s-£48. Sales, 750 tons spot; 950 tons futures.

Lead—£10 3s 9d.

Spelter—£16 15s-£16 12s 6d.

NEW YORK—Tin—$23.75-$23.45.

Copper—Lake, $13.00-$12.12½; electrolytic, $12.87½-$12.00; casting, $12.50-$11.50.

Lead—$4.00

Spelter—$4.40-$4.35 spot; $4.30 February delivery.

Coal.

PITTSBURG—The transportation problem still holds the center of interest but there has been a slight trace of improvement in the car supply. Consumers still fail to get their requirements of fuel and full relief is as far away as ever but at intervals there is a faint improvement. The question of higher prices is at hand as some official annoucement is due as a guide on season contracts.

CINCINNATI.—Fourth pool Pittburg afloat 6½ to7½ cent per bushel, delivered $2.75 to $3.00 per ton, do nut, and slack $1.75, Kanawha delivered $2.75 to $3.00 afloat 6½ to 7 cents per bushel, do nut, and slack delivered $1.65 to $175., smokeless lump delivered $3.00 to $3.25, anthracite.

CHICAGO—There is scarcely more prospect of Eastern coals becoming an influence in the fuel market of the West than a week or a month ago. The same dreary comment is heard that receipts are not increasing. Less coal is arriving from Pennsylvania, West Virginia and Ohio than urgent contracts call for, so that there is no free coal to be had, or next to none, the exception being a few cars of Hocking. Prices are nominally unchanged. Western fuels, however, are somewhat more abundant. Cars are offered at mines more liberally and, the holidays being over, the men are working better. The fever is pretty well out of the prices of Western coals current quotations being about $2.25 for Illinois lump. A further decline of moderate proportion is probable, when supply fully catches up with the demand, a condition that has not yet eventuated. Coke is extremely scarce for spot delivery and active furnaces and foundries are in peril of further stoppages in operations.

Coke.

The car supply in the Connellsville coke trade was better last week and production and shipments show gains. Production gained nearly 30,000 tons and the shipments were over 33,000 tons larger than the week previous. The production in the aggregate was nearly equal to the production of the week but the car supply was irregular and made operations difficult. Because of the car shortage the operations of the week averaged very little better than five days. In one instance two of the largest plants in the region were drawn only two days, the yards being so crowded with stock that it was impossible to draw the ovens without cars.

Despite the poor car supply the month of December made a good record in coke production. The estimates place the month's output at 1,110,023 tons, the largest month's yield of the year except November. November was the banner month of the year and turned out 1,123,626 tons of coke. October was not quite up to the yield of the last two months of the year. The tonnage was very large, however, aggregating 1,025,059 tons. The quarter's record was 3,258,708 tons and was the largest single quarter's yield in the history of the Connellsville coke trade. The tonnage for the year amounted to 12,004,056 tons excluding the operations in the Masontown field. The former largest year's production was in 1899 when 10,261,406 tons were produced.

A summary of the Connellsville region for the week shows 20,505 ovens in blast and 1,500 idle.

The following figures show the scope of operations.

Production for the week	209,224 tons.
" last week	180,673 tons.
Increase	28,551 tons.
Shipments for the week	10,162 cars.
" " last "	8,659 cars.
Increase	1,503 cars.
Shipments in tons for week	226,104 tons.
" " " last week	192,663 tons.
Increase	33,441 tons.

Masontown Field

Shipments for week	455 cars.
" last week	307 cars.
Increase	148 cars.
Shipments in tons	11,830 tons.
" last week	7,982 tons.
Increase	3,848 tons.

Distribution—

To Pittsburg and river points	3,437 cars.
To points West of Pittsburg	5,040 cars.
To points East of Everson	1,682 cars.
Total	10,159 cars.

Milliken Brothers, New York city, will furnish the structural steel for the new mines of the DeBeers Company, limited, at Kimberly, South Africa. The power equipment of the mines will consist of two Westinghouse-Parsons steam turbines of 1,000 k. w. capacity each. An order for pneumatic equipment has been placed with the Chicago Pneumatic Tool Company.

The Northern Engineering Works, of Detroit, Mich., recently shipped electric traveling cranes to Brussels, Belgium; Copenhagen, Denmark; and Scotland.

The George V. Cresson Company, of Philadelphia, has orders for an electric lighting plant for Manila, a sugar crushing outfit for Cuba, and a tube mill for Mexico.

In the Cincinnati District.

Tuesday work was begun on the largest casting ever attempted in the history of the modeling art at the Eureka Foundry Company's plant, at Richmond and Harriet streets, for the Fay-Egan Company. The proposed casting will be of an actual weight of forty tons net after it is ready to be put in operation on the engine for which it is intended. On account of the bulk and weight for the casting, the foreman of the casting department had constructed a crane of the pneumatic pattern, built to handle that weight while hoisting it from the casting pit. Foundrymen, experienced in heavy casting, have discovered that castings which were attempted with a single outlet of molten metal could not be a success when above 30 tons. With this knowledge, the Eureka company had constructed a cupola furnace with two outlets, which feed to ladles of a fifteen-ton capacity. The wheel will be cast in two parts. A core will separate the two parts, which, when delivered at the place were the wheel is to be put into use, will fit the different parts perfectly.

Papers of incorporation have been filed at Columbus, O., the past week by the following companies: The Ada Water, Heat & Light Company, Ada, O., capital \$25,000; The A. H. May Implement Company, New Bremen, O., capital \$25,000; The Beattie Electrical Company, Cincinnati, capital, \$10,000 by Alvin H. Beattie; W. A. Goodman, Anna E. Goodman, William H. Beattie and Wade H. Ellis; The Hausen Automobile Company, Cleveland, capital \$10,000; the Superior Nut Lock Company, Lima \$10,000.

Work has begun for the new plant of the National Steel Foundry near Sharon. General Manager C. C. Robinson was in Cincinnati Saturday, and made final arrangements for the beginning of the new plant. Steel castings will be manufactured for all uses, but a specialty will be made of castings for railroad cars, such as axles.

The Norwood foundry started up during the last of the old year and has added largely to the pig iron melting capacity in Cincinnati.

Industrial Notes.

The Thornton N. Motley Company, of New York city, has obtained orders for machine shop tools for Costa Rica, and electrical material for London.

The Wheeling Roofing & Corrugating Company, Wheeling, W. Va., will begin work this week on the the large mill which it is to build.

Spirit of the Times.

J. Pierpont Morgan has under way a deal of importance to the electrical world, involving a combined capital of \$50,000,000. The Westinghouse Electric & Manufacturing Company, of Pittsburg, and the General Electric Company, in which Mr. Morgan is the controlling factor, are to be brought together and operated under the community of interest plan, of which he is the leading exponent. The news has been confirmed officially.

No statement will be made until the merger has been accomplished. It is announced, however, that negotiations have progressed between the two companies to a stage at which the success of the scheme is assured, and all the details will be closed within two weeks.

The two largest manufacturers of electrical apparatus in the United States will pass into the hands of a syndicate of which Mr. Morgan will be the central figure. The companies have branches in England, France and Germany, which also will pass into the hands of one central organization.

There is said to be good prospects for the building of another rolling mill plant at Niles, O., by parties of that place.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including January 9, 1901:

Pa., N. Y., Eastern Ohio and W. Va.

	Shipments.	Run
Transit	116,755	65,819
Tidewater	86,782	15,269
Southwest	8,868	38,451
Eureka	3,248	150,186
Buckeye, Macksburg oil	78,580	54,383
New York Transit	99,025	
Southern	87,121	....
Crescent	4,827	....
Total	385,176	324,108
Daily averages	77,085	65,897

LIMA.

Buckeye / Indiana Local Division	264,121	218,760
Daily average	52,824	42,752

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana
January 1	\$1.30	\$1.15	\$1.15	\$0.83	\$0.80	\$0.80
January 2	1.30	1.15	1.15	0.83	0.80	0.80
January 3	1.30	1.15	1.15	0.83	0.80	0.80
January 4	1.30	1.15	1.15	0.83	0.80	0.80
January 6	1.30	1.15	1.15	0.83	0.80	0.80
January 7	1.30	1 15	1.15	0.83	0.80	0.80

Coke Prices.

Pittsburg—Furnace, \$2.25@2.50. Foundry, \$2.50@2.75.

St. Louis—Connellsville, \$5.25@5.50. West Virginia, \$4.25@4.50

Cincinnati—Connellsville, \$5.00@5.25. Kanawha, \$4.25@4.50

Stonega, \$4.25.

Pittsburg Items.

An organization of the National Bridge Company of Pennsylvania has been effected and plans are being prepared for a 6,000 ton plant to be built in the Pittsburg district. The company is composed of men who have had years of experience in actual management of structural works. The company has been incorporated with a nominal capital of $5,000 which will be in creased as plans for the plant mature. The exact location for the plant has not been definitely decided upon, though negotiations are pending which will result in the selection of a site in a few days. Headquarters have been established at 505 Fitzsimmons building this city. The company is backed by ample capital to make the plant one of the best equipped structural works in the country the cost of which will approximate $1,000,000. A site of about forty acres will be secured and work will be begun in a few days on the grading. The plant will be in operation early in the summer. Upon getting the structural works in full operation the company will build a plant for the manufacture of steel cars, plans for which are being prepared. E. M. Schofield, formerly manager of the Youngstown plant of the American Bridge Company, is president of the new company, and W. M. Conger, formerly of the American Bridge Company, is treasurer. E. M. Schofield is also engineer for the Groton Bridge Company, Groton, N. Y. and is preparing plans for a 1,000 ton plant to be built at Groton. The Groton plant will be used for light and medium structural work.

The Pittsburg & Buffalo Company, and James Jones & Sons have merged into the Manufacturers' and Consumers' Gas Coal Company. The three companies have been under the same management since their inception but have been operating under different names for commercial reasons. The company has a capital stock of $5,000,000, owns 25,000 acres of coal lands in this district containing mines with a combined daily capacity of 3,900 tons which will be increased to 8,500 tons and brick and sewer pipe plants and stone quarries. Options are held on 15,000 acres of coal land which will be closed in a few days, making the holdings of the company 40,000 acres. Preparations are being made to open a number of additional mines on newly acquired properties. The mines now in operation are the Hazel situated at Canonsburg with a daily capacity of 1,600 tons which will be increased to 3,000 tons: the Bertha mine at at Bruce station with a 700 ton capacity which will be increased 1,500 tons; the Blanch mine at Anderson, Pa., with 600 tons capacity which will be increased to 1,000 tons; the Rachel mine at Wilson station, Pa., with 400 tons to be increased to 800 tons; the Johnetta mine at White Rock, Pa., with 600 tons' capacity which will be increased to 2,000 tons. The officers of the company are: James Jones chairman; John H. Jones, president; T. P. Jones, vice-president; W. J. Jones, secretary; David G. Jones, treasurer; Harry P. Jones, general manager. The general offices of the company are in the Park building this city.

The Black Run Coal Company has begun the work of testing the coal lands it owns in the vicinity of New Kensington. The first test is being made on the James Morrow place, about four miles from New Kensington. It is the intention to make at least six tests on this and adjoining farms, and if coal beds of sufficient thickness are found, several large mines will be opened that will give employment to several hundred miners. This company's holdings, which consist of over 40,000 acres, include purchases made from time to time by A.B . Copeland, of Parnassus, who is acting for the company, and takes in nearly all the territory lying between Verona and Parnassus, and extending as far back from the Allegheny river as Murraysville.

Ground has been bought on the P. F.& W. Railway below Sewickley by the New Berlin Bridge Company, of New Berlin, Conn., upon which the company will build a structural plant. The Western business of the company will be cared for by its Pittsburg plant. The Connecticut plant will continue in operation.

The Garland Chain Company, of Franklin, Pa., has bought 612 acres of ground at Moravia, Pa., near New Castle. It is understood that the company will establish a structural plant on part of the ground.

The A. W. Cadman Manufacturing Company, Water street, Pittsburg, is in the market for a 25 or 30 horse power gas engine for natural gas: either new or refitted.

Tate, Jones & Company, incorporated, this city, will supply a 2,000 horse-power rope drive for the LaBelle iron works, Steubenville, O.

The pickling house at the Shelby Steel Tube Works, Ellwood City, Pa., is being rebuilt and an air hoist installed.

The Cadwallader Tin Plate & Metal Company will apply for a charter January 28, to manufacture iron and steel.

The incorporators are George A. Cadwallader, Joseph Cowley, F. H. Good, Samuel Hunt, Charles A. High and H. S. Loughrey.

Thomas Burton, East Liverpool, O., is looking for a suitable site on which to build a pottery.

Personal.

J. J. Spearman, head of the Spearman Iron Company which he founded, retired from business January 1 and the employes of the Spearman furnace presented him with a gold headed cane. The presentaton address was made by William McDonald, and Mr. Spearman, who is 77 years of age, responded with a brief, but feeling speech. Mr. Spearman is one of the oldest living iron manufacturers in Western Pennsylania. He entered the business in January 1847, when he accepted the management of the Sharon furnace, which was operated at the time by Shoenberger, Agnew & Company. In 1853 he bought the Mazeppa furnace near Mercer, which he operated until 1859, when he became manager of the old historic Sharpsville furnace, where he remained until 1862. In 1872 he organized the Spearman furnace and has ever since been at the head of that corporation. The company recently sold its big blast furnace at Sharpsville to the Oliver-Snyder Steel Company, of Pittsburg, and possession was given January 1.

Samuel McDonald, superintendent of the Bessemer plant of the Republic Iron & Steel Company, Youngstown, has presented his resignation which becomes effective February 1. Charles Hart, furnace superintendent of the Republic, has been appointed to succeed Mr. McDonald. Mr. Hart will in the future have charge of both the furnaces and the Bessemer steel plant. Mr. McDonald will take charge of the new steel plant of the Youngstown Iron, Sheet & Tube Company.

The firm of D. Lamond & Son, Ferguson Block, this city, succeeds D. Lamond, engineer and contractor, in the same line. D. Lamond & Son have the contract for three stoves 19 x 85 feet over all, C. H. Foote, two-pass type for the Central Coal & Iron Company, Tuscaloosa, Ala. The firm is the sole agent for the C. H. Foote fire brick stoves.

Howell G. Hopkins, for a number of years traveling representative of the Richmond Stove Company, will tender his resignation to that firm at once, having accepted a position as sales agent for the Kelley Nail & Iron Company, of Ironton, O.

Joseph Riddell, secretary, treasurer, and manager of the Shenango Machine Company, Sharon, for 20 years has resigned on account of failing health.

Bert Haught, of Court street, New Castle, has been appointed chief chemist at the Eliza furnaces of Jones & Laughlins, limited, this city.

A stove factory, to employ 200 hands is to be established in New Berlin, Union county, Pa.

OBITUARY.

John G. Sadlier.

John G. Sadlier, vice president of the Springfield Foundry Company, of Springfield, O., and president of the National Foundrymen's Association, was shot and killed at Springfield, January 6, as he stepped out of his office, by John Kinney, a former employe. He died before medical assistance could be summoned. Three shots took effect in the breast near the heart, one penetrated the abdomen and the fifth took effect in the hip. Sadlier has managed the Springfield Foundry Company since its existence and was identified with the Indianapolis Frog & Switch Company. He was married and leaves a widow and 13 children.

Timely Trade Reminders.

Renold High Speed Silent Driving Chain is the title of pamphlet No. 201 (32 pages) issued by the Link Belt Engineering Company, of Nicetown, Philadelphia, descriptive of the new device for transmitting power and of which so much has been heard lately. A prominent engineer, commenting on the Silent Chain recently remarked to the effect that chain driving was about to come into its own. It appears from a perusal of the booklet mentioned, that the Silent drive is supplanting other means of transmission in many places, and that almost as soon as its properties are comprehended, engineers suggest innumerable applications for its use.

The Allis-Chalmers Company, has issued a valuable catalogue on hoisting engines. Among the new features illustrated are a number of large cone drums used on mining engines. The machinery of this class is built at the Fraser & Chalmers works, Chicago, Ill.

The American Blower Company has issued an illustrated catalogue of the "A B C" hot blast heaters. A picture of the large Detroit plant is used as a frontispiece.

The Standard Horse Nail Company, New Brighton, Pa., has sent out a calendar for 1902 illustrating reproductions of the boxes in which its nails are shipped.

The National Meter Company, N. Y., has issued an illustrated catalogue illustrating and describing the Nash gas and gasoline engines.

Estimates are asked to add an extension to the workshop and boiler house of the ordnance department at the League Island Navy Yard. Bids will be submitted January 16.

Engineer Still Rebellious.

The annual meeting of the national body of the Marine Engineers' Beneficial Association will be held in Washington next week. A number of delegates from the lake local associations will be sent to attend the conference. Many lake questions are to come up and, in fact, from the present aspect of affairs, it will be a lake dominated meeting.

It looks very much now as if the lake engineers are looking forward to the meeting to furnish them a cue for their action in regard to season's contracts. At present there are mutterings on the lakes about the action of the Pittsburg Steamship Company, and an occasional rebellious sentiment expressed by some of the more outspoken, but they all say that officially the lodges have taken no action. They admit that the contracts offered by Mr. Hayes are better than they could have hoped to obtain through a demand of the union, but object to it because it does not recognize the union. They say that no member of the association could sign that contract, in the face of the instructions of President Uhler, without reading himself out of the organization, and the tone of their utterances leads to the belief that there will be a general abrogation of the contracts after the annual meeting in Washington.

The question has recently come up as to the relations between the vessel owners, other than the Pittsburg Steamship Company and their engineers, and it is said that individual cases are numerous where the men have entered into contracts for the ensuing year, but it has not been made a fleet matter as Mr. Hays made it for the trust. The officers of the M. E. B. A. refuse to discuss these cases.

Shovel Trade Slumps.

A complete shutdown of the recently erected plant of the Pittsburg Shovel Company has resulted from an agreement with the American Shovel Association, which controls the shovel trade and regulates prices in the United States. An excess of factories and a cessation of heavy demand caused the shutdown, and it is not known when resumption will be ordered. The plant was one of the largest in the country, making a full line of shovels.

The Pittsburg Shovel Company was organized some time ago and the new plant was started at Leechburg about three months ago. The capital was $100,000, and about 50 men were employed, making 200 dozen shovels a day. W. S Horner of Goff, Horner & Company is president.

There are 50 to 60 factories in the association, which controls all of the factories making a full line of shovels. Some independents have remained outside. The association has no charter and is really nothing more than a pool. Too many factories were in operation and the output was far in excess of the demand. The agreement with the Pittsburg company was made for this reason.

President Horner says he does not know how long the plant might be closed. It resumption depends entirely on the demand for shovels.

Technical Bodies.

The regular meeting of the Foundrymen's Association, of Philadelphia was held last evening at the Manufacturers' club.

Antonio C. Pesano delivered an address on "Proceedings of the New York Meeting of the National Foundrymen's Association covering the question of the use of molding machines in foundries; the Chicago strike of the Iron Molders' Union; and the capacity of the foundry foreman," etc. W. M. Potter, of E. C. Stearns & Company, Syracuse, N. Y., read a paper on "The Stearns Molding Machine And Snap Flask." Mr. Potter presented and operated one of the machines before the meeting to better illustrate the subject.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 30
Galvanized, car lots, jobbers	2 60
Wire, plain, less than car lots, jobbers	2 35
Galvanized, less than car lots, jobbers	2 75
Wire, plain, car lots, retailers	2 30
Galvanized, car lots, retailers	2 70
Wire, plain, less than car lots, retailers	2 45
Galvanized, less than car lots, retailers	2 85
Wire nails, car lots, jobbers	2 35
Wire nails, less than car lots, jobbers	2 35
Wire nails, car lots, retailers	2 40
Wire nails, less than car lots, retailers	2 50
Cut nails, car lots	2 00
Cut nails, less than car lots, jobbers	2 00
Cut nails, car lots, retailers	2 15

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut		9½c
Copper, light bottoms		8 c
Heavy Composition	9½ to	10 c
Brass Turnings	6½ to	7 9
Heavy Brass	7.25	
Light Brass	5.00	
Heavy Lead	3.75	
Tea Lead	3.50	
Zinc Scrap		$3.00
No. 1 Pewter	16	

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight, 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs $4.75.

Tool Combine Ready.

The Chicago Pneumatic Tool Company, organized under the New Jersey laws, has taken over the following concerns: Boyer Machine Company, of Detroit; Chisholm & Moore Manufacturing Company, of Cleveland; Franklin Air Compressor Company, of Pennsylvania; New York Air Compressor Company, of New York; and the Tate-Howard Pneumatic Tool Company, of London, England. No preferred stock was issued, there being only these securities: Two million dollars in 5 per cent 20-year gold bonds and $5,000,000 of common stock. There remains in the treasury $500,000 of bonds and $2,500,000 of stock. Officers of the corporation are: J. W. Huntley, Chicago, president; W. O. Duntley, Chicago, vice president; J. Y. Moore, Cleveland, second vice president; Ernest P. Wanger, Detroit, treasurer; H. R. Kent, Chicago, asisstant treasurer, and Leroy B. Beardsley, Chicago, secretary.

West Virginia Notes.

State Labor Commissioner I. V. Barton calls attention to wonderful improvements in the glass trade of West Vriginia. It has trebled the past year. Seven window glass factories, one at Morgantown, one each at Cameron, Mannington, Huntingdon and Sistersville, and two at Ciarksburg, have been put in operation within the past few months. The commissioner says hundreds of workmen from the Indiana gas belt are flocking into the state and many manuafcturers are devising plans for locations here. In pressed ware, and electrical supplies great strides have been made. The Riverside Glass Company, at Wellsburg, will shortly install a tank and increase its capacity from a six-pot furnace to 16-pots.

The Riverside Development Company has been organized at Clarksburg. The company will build a suburban town on 35 acres, manufacture brick and lumber, install electric light plants and water works. Dr. John B. Smith and others are incorporators.

Thomas Williams, of Colfax, W. Va., announces that a company will be organized within two weeks to operate the Colfax red brick works idle for the past six months. Many improvements will be made.

The Glen brick and material plant, at Clarksburg, burned last week will be rebuilt. Loss was $15,000. William Thompson is the principal owner.

Mahan & Hamilton have bought 300 acres of land above Wellsburg, W. Va., and will build a carriage and coal car works. The details of the project have not been announced.

The Moundsville Coal Company which sold a few days ago to a company headed by J. C. McKinley, of Wheeling, will sink new a shaft and install new machinery.

Robert E. Umbel, of Uniontown, Pa., has bought 532 acres of coal for $53,108 near the Shore Line Railroad, near Clarksburg.

The Future Discounted.

Judge E. H. Gary, of the United Statse Steel Corporation, announces that the properties heretofore secured by the managers of the Pocahontas coal syndicate, consisting of about 300,000 acres of fuel and coking coal, had been sold to the Pocahontas Coal & Coke Company, which is controlled by the Norfolk & Western Railway Company, and that 50,000 acres of these lands had been leased on a royalty basis to companies whose capital stock is owned or controlled by the United States Steel Corporation.

Within the near future there will be constructed 3,000 modern coke ovens, together with necessary railroads, electric plants, store and other improvements.

The United States Steel Corporation by the lease secured sufficient coal to provide, on the present basis of consumption, for about 30 years. This, with the Connellsvlile region, should furnish coke for upward of 60 years.

Condition of the Blast Furnaces in the United States, January 1, 1902.

Compiled for the AMERICAN MANUFACTURER AND IRON WORLD.

LOCATION OF FURNACES.	CHARCOAL. Total No. Stacks	CHARCOAL. In Blast. No.	CHARCOAL. In Blast. Weekly capac'y	CHARCOAL. Out of B'st. No.	CHARCOAL. Out of B'st. Weekly capac'y	ANTHRACITE AND COKE. Total No. Stacks	ANTHRACITE AND COKE. In Blast. No.	ANTHRACITE AND COKE. In Blast. Weekly capac'y	ANTHRACITE AND COKE. Out of B'st. No.	ANTHRACITE AND COKE. Out of B'st. Weekly capac'y	BITUMINOUS AND COKE. Total No. Stacks	BITUMINOUS AND COKE. In Blast. No.	BITUMINOUS AND COKE. In Blast. Weekly capac'y	BITUMINOUS AND COKE. Out Bl'st. No.	BITUMINOUS AND COKE. Out Bl'st. Weekly capac'y
Alabama	5	2	625	3	793	....	....	....	....	....	39	26	25,459	13	9,475
Colorado	....	....	....	....	....	....	....	....	....	....	3	3	3,750	0	0
Georgia	3	1	316	2	414	....	....	....	....	....	1	0	0	1	740
Illinois	....	....	....	....	....	....	....	....	....	....	18	16	32,602	2	3,460
Kentucky	....	....	....	....	....	....	....	....	....	....	8	4	1,680	4	1,755
Maryland }	5	2	157	8	210	....	....	....	....	....	5	3	5,500	2	600
Virginia }	....	....	....	....	....	....	....	....	....	....	21	13	7,967	8	5,069
Missouri	1	1	483	0	0	....	....	....	....	....	1	0	0	1	856
New England	7	3	274	4	360	....	....	....	....	....	....	....	....	....	....
New Jersey	....	....	....	....	....	9	3	3,018	6	3,066	....	....	....	....	....
Spiegel	....	....	....	....	....	3	3	535	0	0	....	....	....	....	....
New York	3	1	750	2	175	7	2	1,275	5	2,798	10	4	5,818	6	3,830
North Carolina	....	....	....	....	....	....	....	....	....	....	2	0	0	2	463
Ohio—Eastern, Central and Northern	....	....	....	....	....	....	....	....	....	....	24	14	22,581	10	18,082
Hanging Rock District	6	2	140	4	303	....	....	....	....	....	12	10	6,157	2	560
Hocking Valley	....	....	....	....	....	....	....	....	....	....	3	2	695	1	350
Mahoning Valley	....	....	....	....	....	....	....	....	....	....	13	11	24,769	2	3,100
Oregon and Washington	2	1	210	1	280	....	....	....	....	....	....	....	....	....	....
Pennsylvania general	8	2	90	6	506	....	....	....	....	....	6	5	5,698	1	1,150
Juniata and Conemaugh Valleys	....	....	....	....	....	....	....	....	....	....	15	9	11,798	6	3,503
Lebanon Valley	....	....	....	....	....	11	9	6,962	2	875	....	....	....	....	....
Lehigh Valley	....	....	....	....	....	29	18	9,637	11	5,358	....	....	....	....	....
Pittsburg district	....	....	....	....	....	....	....	....	....	....	33	29	74,119	4	8,400
Spiegel	....	....	....	....	....	....	....	....	....	....	1	1	2,512	0	0
Schuylkill Valley	....	....	....	....	....	16	11	8,700	5	3,110	....	....	....	....	....
Shenango Valley	....	....	....	....	....	....	....	....	....	....	17	15	22,859	2	2,150
Susquehanna Valley, Upper	....	....	....	....	....	3	2	1,360	1	335	....	....	....	....	....
Susquehanna Valley, Lower	....	....	....	....	....	11	8	6,358	3	850	....	....	....	....	....
Tennessee	3	1	90	2	615	....	....	....	....	....	17	11	7,317	6	3,670
Texas	4	0	0	4	865	....	....	....	....	....	....	....	....	....	....
West Virginia	....	....	....	....	....	....	....	....	....	....	3	3	3,958	0	0
Wisconsin and Michigan	10	6	3,611	4	1,405	....	....	....	....	....	....	....	....	....	....
Wisconsin and Minnesota	....	....	....	....	....	....	....	....	....	....	6	2	2,000	4	2,783
Total	57	22	6,746	35	5,926	89	56	37,845	33	16,392	258	181	267,239	77	69,946

Blast Furnaces Jan. 1, 1902.

The following table gives the number and capacity of furnaces in and out of blast January 1, 1902:

Condition of Blast Furnaces in the United States January 1, 1902.

Fuel.	In Blast. No.	In Blast. Weekly Capacity.	Out of Blast. No.	Out of Blast. Weekly Capacity.
Charcoal	22	6,746	35	5,926
Anthracite and Coke	56	37,845	33	16,392
Bituminous and Coke	181	267,239	77	69,946
Total	259	311,830	145	92,264

Compared with December 1, the standing of the furnaces in blast was as follows:

Furnaces in Blast December 1, 1901, and January 1, 1902.

Fuel.	December 1. No.	December 1. Weekly Capacity.	January 1. No.	January 1. Weekly Capacity.
Charcoal	25	7,522	22	6,746
Anthracite and Coke	57	41,134	56	37,845
Bituminous and Coke	183	278,294	181	267,239
Total	265	327,000	259	311,830

The above comparison shows:

Decrease in active charcoal furnaces, 3.
Decrease in weekly capacity charcoal furnaces, 776 tons.
Decrease in active anthracite and coke furnaces, 1.
Decrease in weekly cap. anth. and coke furn's, 3,339 tons.
Decrease in active coke and bituminous furnaces, 2.
Decrease in w'kly cap. bit. and coke furnaces 11,055 tons.
Net decrease active furnaces, 6.
Net decrease weekly capacity, 15,170 tons.

The following tables show the anthracite and coke and the bituminous and coke furnaces in blast in the various districts December 1 and January 1.

Anthracite and Coke Furnaces in Blast Dec. 1, and Jan. 1, 1902, by Districts.

District.	December 1. No.	December 1. Weekly Capacity.	January 1. No.	January 1. Weekly Capacity.
New Jersey	4	3,614	3	3,018
Spiegel	3	540	3	535
New York	2	1,339	2	1,275
Penna—Lebanon Valley	9	7,273	9	6,962
Lehigh Valley	17	9,824	18	9,637
Schuylkill Valley	12	10,307	11	8,700
Susquehanna Val. Upper	2	1,473	2	1,360
Susquehanna Val. Lower	8	6,814	8	6,358
Total	57	41,184	56	37,845

Bituminous and Coke Furnaces in Blast Dec. 1, and Jan. 1, 1902, by Districts.

District.	December 1. No.	December 1. Weekly Capacity.	January 1. No.	January 1. Weekly Capacity
Alabama	24	23,062	26	25,459
Colorado	3	3,828	3	3,750
Georgia	0	0	0	0
Illinois	15	30,649	16	32,602
Kentucky	4	1,640	4	1,680
Maryland	3	5,728	3	5,500
Missouri	1	856	0	0
New York	3	4,601	4	5,818
North Carolina	0	0	0	0
Ohio—East'n, Cent. & Nth'n	20	33,587	14	22,581
Hanging Rock	10	6,313	10	6,157
Hocking Valley	1	467	2	695
Mahoning Valley	12	26,645	11	24,769
Pennsylvania, general	5	5,907	5	5,698
Juniata & Conemaugh Val.	8	11,121	9	11,798
Pittsburg district	30	77,189	29	74,119
Spiegel	1	2,921	1	2,512
Shenango Valley	14	20,545	15	22,859
Tennessee	11	7,845	11	7,317
Virginia	12	8,289	18	7,967
West Virginia	3	3,862	3	3,958
Wisconsin & Minnesota	3	3,139	2	2,000
Total	183	278,294	18[illegible]	267,239

HISTORICAL SKETCH OF THE FOUNDATION OF THE METRIC SYSTEM.

BY M. BASSOT. *

IN December 10, 1799, the law was promulagted which established the legal status of the meter and kilogram as basis of the new system of weights and measures and which was rendered obligatory in France.

The idea of establishing a universal system of weights and measures derived from a single standard, invariable and taken itself from nature, does not seem to go back of the beginning of the seventeenth century. In truth, certain writers, as Paucton and Bailly tried to establish a relation between the itinerary measures of old and the length of a terrestrial arc measured by their astronomers: but the uncertainty of the true value of the early measures presented any serious foundation for a reasoning which depends on an arbitrary estimation of these values made precisely in view of conforming to a preconceived system.

We cannot fail, on the other hand, to consider as an advance toward the idea of a universal system, the tentative, though otherwise unfruitful efforts made by Charlemagne and others of his successors to establish in their states a uniform system of weights and measures.

The first idea of such a system seems to have been conceived almost simultaneously by Huygens, Picard and Mouton, an astronomer of Lyons. The last named proposed to take for a unit the length of a geometric foot (virgula geometrica) equal to one sixth hundred thousandth part of a terrestrial degree, and to preserve the length perpetually, he remarked that a pendulum of this length made 3,959 1-5 vibrations in one-half hour.

Huygens and Picard proposed as a unit the length of a pendulum beating seconds. "The length of a pendulum beating seconds of mean time," said Picard, would be called the astronomical radius of which the one-third would be the universal foot. The double of the astronomical radius would be the univerasl toise (fathom), which would be at Paris as 881 is to 864. If we should find by experience that the pendulums were of different lengths in different places, the supposition we had made touching a universal measure depending on the pendulum would not stand, but it would not alter the fact that in each place the measure would be perpetual and invariable."

In 1718 Cassini suggested taking one six-thousandth part of a minute of one degree of longitude or one one-millionth part of the terrestrial radius. Later, another scientist, DuFay, proposed again the length of a seconds-pendulum and even obtained from the minister a plan of regulation, but his death and that of the comptroller-general, Ory, put an end to this.

La Condamine continued the work of DuFay and published on the subject in the Memories de l'Academie des Sciences for 1747, page 489, a very interesting memoir. "I propose", he said, "to take as the unit the length of the seconds-pendulum at the equator, which is 36 inches 7 15-100 lines at Paris, employing the toise of Peru. Messieurs Godin, Bouguer and myself agree to almost 1-100 of a line over the absolute length of the pendulum at Quito." He considered this measure as more natural and independent of the different claims of each country. "It will not be less necessary," he adds, "to consider whether we should not, on the one hand, keep the division of the toise in six feet, on the other, to reject the division of the foot into twelve inches and the inch into twelve lines and substitute the decimal division of which the advantages are well known. Finally it will be necessary to find the most simple experiments to reduce to a round number of the new measures the acre, the bushel, the hogshead and all linear measures, square or cubic. This reduction would also lead to the reformation of the weights which are only of solid measure, until now very defective, and the determination of a linear measure might render these equally in variable, or at least stable in all times and places. I have occupied myself," he

* Translated by Miss F. E. Harpham, Chief Computor in the Astronomical Department of Columbia University

said "in examining the means which might be employed to render the weights and measures uniform throughout the kingdom, but I doubt yet whether the unity which would result would be proportionate to the difficulties of all kinds which would necessarily be made in a multitude of contracts, of yearly payments, of feudal rights and other acts of all kinds. I have not yet renounced the project and I have seen with satisfaction that the Assembly of Haute-Guyenne have taken it into consideration. It is, in effect, a kind of amelioration which can be undertaken partially and the example of a happy success in one province would essentially influence opinion."

It is permitted to suppose from what precedes that the reform would have been slow in coming into effect if the excitement of ideas which characterized the French revolution had not broken abruptly the force of tradition and favored new and bold ideas. In the Assembly of the States a certain number of memorials called the attention of the public power to the necessity of reform of weights and measures. Various works appeared on the question: the Academy of Sciences continued to study the question actively. Messiuers Dvernoy, an officer of the royal corps of engineers, Collignon, a lawyer of Parliment and de Vileneuve, presented to the Committee of Agriculture and Commerce interesting memoirs on this subject.

Talleyrand was the first political man who knew how to bring the problem clearly before public authority. In his proposition made to the National Assembly in April, 1790, they rejected the method of adopting as the element one sixty-thousandth part of the length of a degree of a meridian cut into two equal parts by the parallel of forty-five degrees. He objected that the measure of the standard made by Lacaille which gives 57,030 toises is susceptible of an error of thirty-four toises. He proposed as the fundamental unit length of a seconds-pendulum at 45 degrees to which they should give the name of ell, and as the unit of weight, distilled water at 14.4 degrees which would be contained in a cubic vessel of which the height should be one-twelfth the length of the pendulum. He asked the government to invite the English to participate in the measures and that, in consequence, the measures should be executed together by the Academy of Sciences of Paris and the Royal Society of London.

May 6 following, the Marquis de Bonnay presented to the National Academy a report entirely favoring Tallyrand's proposition. In the course of this same meeting Bureau de Pusey, while approving the conclusion of the report, treated the question of the division of a unit of length and pointed out the superiority of the decimal division over the old divisions by the great simplification which it brought into the caclulations. At the end of this discussion, the National Assembly on May 8, 1790, rendered a decree which was sanctioned by the king August 22, following, and which we must cite entirely because, in a way, it is the acte de naissance of the Metric System. "The National Assembly, desiring that all France shall forever enjoy all the advantages which will result from uniformity in weights and measures, and wishing that the relation of the old measures to the new should be clearly determined and easily understood, decreed that His Majesty shall be asked to give orders to the administrators of the different departments of the kingdom, to the end that they procure and cause to be remitted to each of the municipalities comprised in each department and that they send to Paris to be remitted to the Secretary of the Academy of Sciences a perfectly exact model of the different weights and elementary measures which are in usage.

"It is decreed further that the king shall also beg His Majesty of Britain to request the English Parliament to concur with the National Assembly in the determination of a natural unit of measures and weights: and in consequence, under the auspices of the two nations, the Commissioners of the Academy of Sciences of Paris shall unite with an equal number of members chosen by the Royal Society of London in a place which shall be respectively decided af most convenient, to determine at the latitude of 45 degrees or any other latitude which may be preferred the length of the pendulum, and to deduce an invariable standard for all the measures and all the weights; and that after this operation is made with all necessary solemnity, His Majesty will be asked to charge the Academy of Sciences to fix with precision for each royal municipality, the relation of the old weights and measures to the new standard and to compose afterward for the use of the municipalities the usual books

and elementary treatises which will indicate with clearness all these propositions.

"It is decreed further that these elementary books shall be sent at the same time to all the municipalities to be distributed; at the same time there shall be sent to each of the muicipalities a certain number of new weights and measures which they shall distribute gratuitously to those who would be caused great expense by this change; and finally, six months only after the distribution, the oid measures shall be abolished and replaced by the new.

"The National Assembly decrees that the Academy after consultation with the officers of the mint, shall offer their opinion as to the suitability of fixing invariably the inscription of the coin metal to the end that the kinds shall never be altered except in their weight, and whether it would not be useful that the difference tolerated in the coins under the name of remedy be always beyond requirement, that is to say, that one piece may exceed the weight prescribed by law but must never be inferior.

"Finally, the Academy shall indicate the scale of division on which it believes most convenient for all weights, measures and coins."

The Academy at once set itself to work, and on October 27, 1790, the first commission, composed of Borda, Lagrange, Laviosier, Tillet and Condorcet presented their report on the title of coined metals and the scale of uniform division, and gave the preference to the decimal division over the duodecimal. Laplace in his Systeme du Monde has explained in a masterly way the reasons which determined the commission.

"The identity of the decimal calculation and that of integral numbers," he said, "admits no doubt of the advantages of the division of every kind of measures into decimal parts; it is sufficient, to convince oneself, to compare the difficulties of complex multiplications and divisions with the facility of the same operation under integral numbers, a facility which becomes even greater by means of logarithms of which, by simple and inexpensive intruments, the use could be made extremely popular. In truth, our arithmetical scale is not divisible by three or four, two divisions whose simplicity render them very common. The addition of two new characters is sufficient to procure this advantage but a change so important would have been infallibly rejected with the system of measurers which was attached to it. Moreover, the duodecimal scale has the inconvenience of requiring that we retain the products of twelve numbers which surpasses the ordinary length of the memory to which the decimal scale is proportionate. Finally we should lose the advantage which probably gave rise to our arithmetic, that which causes the fingers of the hand to be used in enumeration. We did not hesitate then to adopt the decimal division and for the purpose of uniformity in the whole system of measures, we decided to derive them all from the same linear measure and its decimal divisions. The question is then reduced to the choice of this universal measure which has been given the name of meter."

On March 19,1791, the commission composed of Borda, Lagrange, Laplace, Monge, and Condorcet presented to the Academy their report upon the choice of the unit of measure. The commissioners were of the opinion that the units which appear the most proper to serve as a base could be reduced to three; the length of the pendulum, the quadrant of a circle of the equator, the quadrant of a circle of a meridian.

The commission then propose to measure an arc of a meridian from Dunkerk to Barcelona, a distance a little more than 9 degrees 30 minutes, 6 degrees North, and 3 degrees 30 minutes South, of the mean parallel and presenting the advantage of having its two extreme points at the level of the sea. In addition, it proposes to determine in latitude 45 degrees at the sea level, in a vacuum and at the temperature of melting ice the number of oscillations which a simple pendulum equal to the one millionth part of a meridan would make in one day so that this number being once known, we could find again this measure by the oscillations of the pendulum. The operations necessary to determine he bases of the new system would be:

One degree—The determination of the difference of latitude between Dunkerk and Barcelona.

Two degrees—Measure of the old bases.

Three degrees—Verification of the triangles and prolongation of the chain.

Four degrees—Observations of the pendulum at 45 degrees.

Five degrees—Verification of the weight in a vacuum, at the temperature of melting ice, of a given volume of distilled water.

Six degrees—Reduction of old measures to new.

Condorcet, secretary of the Academy, communicated the result of the work of the Commission to the legislative corps and March 26, 1791, the National Assembly, on the proposal of Talleyrand, rendered the following decree:

"The National Assembly consider that in order to succeed in the establishment of a unit of weights and measures in conformity with the decree of May 8, 1790, it is necessary to fix the unit of measure natural and invariable, and that the only way to extend this uniformity to other nations is to induce them to adopt the same system of measures and to choose a unit which in its determination will include nothing arbitrary or particular to the situation of any nation on the globe, considering, moreover, that the unit proposed by the advice of the Academy of Sciences, March 19 of this year, fulfills all the conditions it has decreed and decrees: That it shall adopt the length of one-fourth of a terrestrial meridian as a base for the new system of measures; that inconsqeuence, the operations necessary to determine this base, such as are indicated in the suggestion of the Academy, and especially in measuring an arc of the meridian from Dunkerk to Barcelona shall be executed; that, in consequence, the Academy of Sciences is charged to appoint commissioners who shall occupy themselves without delay in these operations, and shall concert with Spain for those which must be made on her territory."

The Academy immediately named five commissions:

One degree—Cassini, Mechain and Legendre to determine the difference of latitude between the extreme points and to measure the triangles;

Two degrees—Monge and Meusnier to measure the bases;

Three degrees—Borda and Coulomb for observations of the pendulum:

Four degrees—Lavoisier and Hauy for researches on the weight of distilled water at zero in a vacuum;

Five degrees—Tillet, Brisson and Vandermonde to compare the old measures with the toise and livre of Paris.

The remaining commissions were changed later, and in particular Delambre and Mechain were placed in sole charge of the geodetic and astronomical operations which were finished eight years later.

Pending the prosecution of these, the Academy studied the nomenclature. The commissioners named for this purpose presented July 11, 1792, a report upon the nomenclature of linear and surface measures and January 19, 1793, a report upon the unit of weights and the nomenclature of their divisions. Finally, a general report summarizing and modifying in some parts the preceding reports was presented to the Academy May 29, 1793, by Borda, Lagrange and Monge. The report discussed first the decimal division which had been adopted for the astronomical circle which Delambre and Mechain used and for the astronmical clock employed by the same workers:

Next followed the question of nomenclature: two propositions were made concerning this, one of which gave to the subdivisions of the measures compound names which indicated the decimal relation which existed between them, and the other gave names which were simple, monosyllabic and independent each of the others. The commissioners of 1792 had adopted the first system; the commission of 1793, conforming to the desire of the Academy, preferred the second, but when the propositions were submitted to public authority the Committee of Public Instruction adopted that one of the two nomenclatures which contained less names and different from known measures; it also made some changes even in this very same nomenclature. The debuty Arbogast had charge of the report, and upon his proposal the convention rendered, August 1, 1793, the following decree:

"The convention is convinced that the uniformity of weights and measures is the greatest benefit which can be offered to French citizens," etc.

It decrees as follows:

Art. 1 The new system of weights and measures, based on the measure of a terrestrial meridian and the decimal division, will serve uniformly throughout the Republic.

Art. 2. The provisions of a preceding article will be obligatory one year only from the day of the publication of the present decree.

Art. 3. There will be made by artists chosen by the Academy of Sciences, models of the new weights and measures which will be sent to all the administrators of departments and districts.

In spite of considerable events which occured at that time, the convention did not for an instant lose sight of its reformatory work, and caused accounts to be rendered to it periodaically of the state of the work of the commission of weights and measures. A decree of March 31, 1793, recommended to the departments the commissioners of the Academy for astronomical observations. But the public authority, irritated by the slowness of an operation the difficulties of which were beyond its comprehension, did not hesitate to interfere in an injurious manner in the question; on August 8, 1793, a decree suppressed the Academy of Sciences and another decree on September 11 replaced it by a temporary commission: finally on December 23, 1793, a decree of the committee of Public Safety purged the commission of weights and measures by the removal of six of its members. The work continued with no less activity and a great number of points of detail were regulated by successive decrees.

A decree of 17 Vendemiaire (first month), year II. applied the metric system to the tonnage of merchantmen:

A decree of one Brumaire (second month, year II. passed upon the report of de Fourcroy and ordered the manufacture of the standard model. Article one reads thus:

"The Commission of weights and measures will cause to be constructed for the legislative corps standards of weights and measures in platinum, to wit: one standard meter, one standard pint and one standard grave with its divisions. These standards kept under the immediate authority of the legislative corps shall serve as prototype models for all the Republic."

A decree of four Firmaire (third month), related to the calendar and established the decimal division of the day;

A decree of 17 Frimaire, year II. related to the coinage of metals;

A decree of 28 Frimaire. year II. modified the division of weights:

A decree of 30 Nivose (fourth month), year II modified the nomenclature;

A decree of 21 Pluviose (fifth month), year II. called a conference to diseuss the decimal division of the hours.

Toward the beginning of year II. the state of advancement of the work permitted the settling of all points of detail relative to the establishment of the new system.

On 11 Ventose (sitxh month,) Prieur (de la Cote d'Or) presented to the convention a very complete report pointing out the principal conditions for making the new system satisfactory and indicating the operations of every kind, scientific or administrative, necessary to make permanent the different parts and practical. The report was accompanied by instructions and a vocabulary; the instructions contained a succinct historical resume of the question, referred to the gratitude of the public to the scientific men who had taken part in the work, and explained the reasons for adopting the nomenclature proposed and its sources where it was possible; the vocabulary defined in a precise manner the measurers adopted and their divisions.

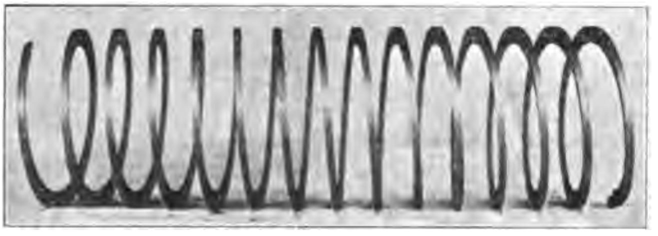
The meter is thus defined:

"Meter: Length of the standard of measure of the Republic equal to one ten millionth of a quadrant of a meridian, in length about 3 feet 11½ l."

(To be continned.)

Wonderful Springy Cast Iron.

AS knowledge of the properties of cast iron increases some wonderful results have been obtained. Not the least of these is that of a mixture secured by the National Gear Wheel & Foundry Company, of Allegheny, Pa. A sample of the elasticity of this iron, which has been named "Homo" iron, was recently cut as a spiral from a solid casting which was machined down to be used with a worm gear. The properties of this iron were not made known, but the proprietor of the foundry made some big claims for its tensile strength and said that a test of the Pittsburg Laboratory proved it to be no less than 40,000 pounds per square inch. Gun metal, the strongest of all cast irons, is credited with a tensile strength of 37,100 pounds, according to tests from Mr. R. A. Robertson's No. 1g gun metal tests, and cast iron for heavy machinery is reported at 28,676 accordin, to West.



As will be seen from the illustration a spring was cut from the solid piece of cast iron eight inches in diameter. It was brought into the office of the National Gear Company by a machinist who had seen a smaller spiral exhibited in the office. The outside of the spring was one-half inch across the face, one inch in depth and was cut to a feather edge on the inner side. Mr. Nusser, of the company, did not wish to break the spring hence it could not be learned just how far it would stretch before breaking, but he held it at full arms' length, pulling at each end, stretching it almost four feet without it showing any sign of having reached the limit. The illustration is a photograph of the spring in its normal position. The block from which it was cut was 14 inches long, hence the springiness of the cast iron seems remarkable.

The spiral cutting was compressed by being placed on a table and a boy putting his weight on it to keep it down. It compressed to $7\frac{3}{8}$ inches. The illustration shows this, the photographs having been taken in the office of the AMERICAN MANUFACTURER and none of the people from the National Company had anything to do with it.

The grain of this iron is the finest ever seen in cast iron. Some persons not familiar with metals could not be made to believe that it was not steel and pointed to the grain as evidence. It was not

until chips from the feather edge of the inside were taken off and exposed that the doubtful ones were persuaded that it was cast iron. The spring was returned to the National Company as soon as the photographs were taken where it is now on exhibition in the office of the company. A number of much smaller springs, and some with a width of less than a quarter of an inch, are kept on exhibition, and these can almost be pulled out in a straight line, none having broken so far. This proves that the spring or spiral illustrated was not merely an accidental cutting from an exceptionally good piece of iron, but that the iron seems to run uniform in quality and really holds together better than steel or wrought iron would do under similar circumstancs and cutting.

New Slag Handling Apparatus.

IN order to avoid the usual trouble incident to cooling and disposing of slag from blast furnaces, Patrick Meehan, of Lowellville, Ohio, has invented an apparatus which takes the slag as it comes from the furnace, cools it, separates it into particles of a size convenient to be handled and conveys it in such shape to the cars without the difficulties and inconvenience of the old way of handling slag.

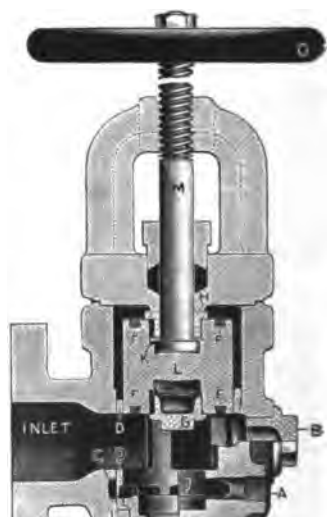
A reservoir or receptacle formed of iron or steel plates, which form a strong durable structure constructed perferably circular in form is used. The top of the reservoir is slightly conical, and has an opening to which the pipe or stack is connected. This reservoir is located conveniently near the blast furnace, and is arranged below the level of the ground or furnace floor, the stack extending to any height. The runners lead into the upper portion of the reservoir and directly beneath them and in line are nozzles connected by pipes to a water, steam, or other fluid supply. The bottom is inclined, and at its lower end is the outlet controlled by a vertically movable dam or door. This door is operated through the medium of upright rods which pass through the top of the furnace and are connected with hand operating mechanism.

On the outside of the furnace wall and extending from the outlet in the bottom thereof is a casing which contains an endless conveyor having pans or buckets which carry the slag as it is discharged to a chute located above the track upon which the slag-receiver cars run. When the improved apparatus is in use the slag as it is drawn from the blast furnace is conducted by the runners into the reservoir. At the same time water is supplied to the nozzles beneath the runners and as the slag drops into the reservoir this water strikes it with sufficient force to break it up into small particles while at the same time it is cooled. Owing to the inclined bottom, the slag so divided passes to the lower end of the reservoir where the outlet is located. When it is desired to remove the slag the gate is raised, allowing it to pass into the outer casing. Power is then applied to the conveyor so that each pan as it reaches the bottom scoops up a portion of the discharging slag carrying up to the upper chute whereupon it gravitates into the cars. The steam created by the discharge of the water on the hot slag escapes through the stack, so that all the danger and inconvenience attending the old method are done away with, and the confusion occasioned is avoided.

The "Duro" Blow-Off Valve.

BLOW-OFF valves have probably given more trouble than any of the other fittings which are part of boiler equipment.

The "Duro" blow-off valve made by the Lunkenheimer Company, Cincinnati, O., it will be seen by the illustrations, is quite similar to the iron body angle blow-off valve which has been so extensively used for some years past. The object of this improved valve is to include whatever merits the old-style valve possessed. and, in addition, a distinctive feature, the novelty of which will at once impress users of its practicability. Heretofore in all makes of blow-off valves the seat was so located that as the disc approached it there would be an accumulation of scale and sediment. The effect of this accumulation would be to cut out the bearing surface to such an extent that in a short time the valve would become leaky. Various methods have been invented whereby the disc would fit tightly in the valve body, the object being to prevent the scale from passing on to the seat bearing after the disc had passed and cut off the inlet. This method, however, has not proven satisfactory, as the valve body would soon wear, and, in a short time, permit the passage of scale and sediment. In the "Duro" valve these defects have been overcome. The plug fits snugly in a separate and easily removable bronze casing, which can be readily replaced when worn. Any accumulation of scale on the seat is prevented by a jet of steam blowing over.



In operating, when it is desirable to close the "Duro" blow-off valve, the disc is screwed down in the usual manner. As it approaches the level of the inlet the edge of the disc passing the lower edge of the casing (D) cuts off a great deal of the flow of water, sediment, etc. At this time the valve in the steam pipe leading to inlet (A) should be opened and the steam admitted to the annular space (C), from whence it passes through slot (J) and blows off the entire surface of the seat (E). In the meantime the disc is being screwed home to the seat, which also cuts off the flow of steam from inlet (A) as well as the blow-off from the boiler. The valve in the pipe leading to inlet (A) can be left open at all times, as the disc of the blow-off valve would keep this outlet closed.

It will be seen that, by the time the seating is accomplished, all scale and sediment have been blown off the seat and the surface is clean; hence there is nothing present to cut out bearing surfaces. The disc, or plug, is reversible, having two valve or seating faces, which can be changed at will, thereby increasing the durability and efficiency of the valve considerably. These valve or seating faces in the disc consist of dovetailed slots, which are filled with Babbitt metal, and, when both are cut or worn out, the old Babbitt metal can be melted out and new metal poured into the slots, and can be faced off,

thus renewing this wearing part of the valve. The seat-ring (E) and casing (D) are easily removable, and, as these are interchangeable, new ones can be supplied at small cost. There is also provided a plug (B) opposite the inlet, so that, if desired, this can be taken off and a rod run through the blow-off pipe to clean it out.

Apparatus for Bending Tubes.

FRANK G. HAMPSON, of London, has patented in this country an apparatus for bending tube rods, etc., in the cold condition and without requiring the interior of the tube to be filled with any supporting material. The tube is bent alternately to each side of the general axial or central line; but the apparatus may be used for making bends of any kind in the tube and not necessarily a number of similar bends.

The inventor employes a table or bed-plate, for example cast-iron, and in this is placed any desired number of holes to provide centers about which the tube can be bent. The holes may be formed in the plate or the plate may be made with provision for varying the positions of the holes, which for example, may be formed in separate pieces of metal adapted to be closed up or arranged in any position. Instead of employing holes into which pins will be inserted, pins may be employed with means for dressing them or holding them out of the way until they are needed. At one end of the apparatus a clamp is provided formed in halves, each having a semicircular recess, so that when the halves are clamped together they will firmly grasp the end of the tube. A clamping screw may be employed for securing the tube in the clamps. Where it is intended that the tube shall have a bend close to the end, one-half of the clamp may form a portion of a fixed roller about which the tube is intended to be bent.

The holes are adapted to receive studs or pins, upon each of which will rest a roll or curved bending surface and above that the end of a lever, operated by hand or otherwise, by means of which the tube is bent. The lever carries a roller, between which and the tube to be operated upon is placed a strip of metal or slipper having a semicircular recess throughout its length on one side and flat upon its back where the lever-roller works. The lever-roller may be adjustable and may be spring controlled.

The operation is as follows: To bend a tube, the first and fixed roller or bending-surface is placed upon the first pin, this particular roller or bending-surface being, if desired, provided with pins or otherwise adjusted so that it will not turn. The tube is placed in the groove of this first bending roller or surface and its edge rasped between the clamps. The end of the lever, which is provided with a suitable hole, is placed over the projecting end of the pin and the loose strip or cover placed upon the tube between it and the lever-roller, so that that portion of the tube fits betweecn the semi-circular recess in the fixed roller or surface and the similar recess in the strip or cover, so that at the point where it is subjected to the bending stress it is in effect held in a tube. By moving the lever upon its pivoted end as a center the tube is bent around the roller or curved surface to the desired extent and the lever then removed and placed upon the next pin in the series, which is placed in to the second hole in the table. Upon the pin, below the lever, is a second roller, which need not be fixed, and the cover is then applied and the lever operated as before, but probably in the reverse direction, according to the particular bend to be applied to the tube, and the tube again bent in the same manner as before. The various pins and rollers of the series are then successively applied and used in the same manner, and at the end of the series the bending of the tube is completed according to position, shape and number of the bending rollers or surfaces, and so on with successive tubes. It is desirable to have the various purchase-points rigidly fixed and unyielding but springs or yielding appliances may be employed if desired.

By using the recessed strip or cover between the lever-roller and the tube the latter is saved from being flattened or distorted, as would be the case if the roller operated directly upon the tube. The cover-plate or slipper is made straight and with a flat back for the lever-roller to engage.

WHAT TO DO WHEN THE GAS ENGINE STOPS.

Continued—BY ALBERT STRITMATTER.

IN the first part of this article were considered the steps necessary in investigating in a methodical manner the failure of a gas or gasoline engine to run when caused by difficulty in securing a supply of fuel in the compression of the charge or in its ignition. We have yet to consider the questions of exhaust, adjustments, lubrication, etc.

The question of the exhaust from a gas engine is one which should be considered very carefully in arranging the installation of the engine. As the burned gases are not pleasant, the exhaust should not be discharged under windows, etc. The pipe will of necessity be very hot and should not be placed in contact with wood or other inflammable materials. A very nice, although most too expensive a method to be adpoted in a great many cases, is to use asbestos packing or covering around the pipe when it must be run close to woodwork. A great deal of the trouble from gas and gasoline engines is due to the exhaust pipe not being arranged correctly. It should be as short as possible and with the smallest number of bends that are necessary. Where it is impossible to avoid having a very long pipe, an exhaust pot must be placed close to the engine. Too long a pipe or one with too many bends in it will cause a strong back pressure of burned gases into the cylinder and this will foul the cylinder and incoming charges to such an extent that they will not ignite, or if they do will give only a weak explosion. If an exhaust pipe is led into a chimney, it should be carried up to the top of the building, as the exhaust gases may collect in the chimney and cause damage. Where the pipe is led simply into the chimney, it frequently occurs that through improper mixtures or failure of the igniter, etc., an unexploded charge of fuel will collect in the chimney and be exploded by the flame from the next charge which is exploded and exhausted, which results in an explosion in the chimney doing considerable damage. These explosions, when they occur in an exhaust pipe, do no harm except possibly to break some of the muffler plates. They may occur with any make of engine and result from improper mixture, failure to ignite, back pressure from clogged up exhaust ports, valves or muffler, or from too long an exhaust pipe or one with too many bends as explained before.

The exhaust valve and exhaust passages of a gas engine have been aptly likened to the human intestines or to the sewers of a large city. Therefore we understand that the exhaust system of a gas engine is as important in the successful operation of the engine as are the mixtures, compression and ignition. We have, in the first article, investigated these three operations of the engine and, if we still have not located the difficulty, will look first at our exhaust muffler to see if the perforated plates are filled up with burned grease, etc. If they are, we will take them off and put them into a fire, thus cleaning them thoroughly, and will then replce them. If they have been clogged up for any length of time, the probablities are that the auxiliary exhaust port, if there is one, and the exhaust valve are, likewise clogged with the burned grease and smoke, and they should be cleaned thoroughly also. We are, of course, assuming all along that our engine is properly designed. If, however, we have an engine with too small an exhaust valve, we are sure to have trouble with probably no way in which to remedy it. The same will apply to the inlet valves.

One trouble caused from the exhaust pipe is that when the engine is running the pipe gets exceedingly hot and on cooling frequently condenses moisture inside of it. As soon as an attempt is made to start it again, the moisture is likely to be sucked into the cylinder and cause difficulty in starting. The exhaust pipe should, if possible, be placed so that the water cannot run back close to the engine, but if this trouble is encountered frequently a drain cock should be placed at the lowest point in the pipe to enable the operator to drain off this condensed moisture.

The end of the exhaust pipe must be so located that sand or dirt and water cannot be sucked back into the cylinder and cut it up. This is one objection to placing an exhaust pipe in a chimney without carrying it to the top of the building.

Finally, if we have not yet located the difficulty with our engine, we must look at the various points of adjustment, lubrication, etc. Many engine operators have a wrong idea as to the water cooling system. They think that the water coming from the engine must be very cool. This is not the case for the water circulating system is intended to carry off only the surplus heat. Experiments show that best fuel consumption is obtained when the water leaving the cylinder jacket is not below 160 to 180 or 190 degrees, F., and so long as the water is not actually boiling no damage is likely to be done to the engine, although 180 or 175 degrees is about the correct temperature. Of course at this heat one could not keep his hand in the water. Where a natural circulating system is used, care must be taken that the overflow pipe is completely submerged. If it is not, air will get into it and stop the circulation of water. This overflow pipe also should be so placed that there is no point in it lower than another point between it and the engine. The object is to have a continually increasing height from the engine to the tank, so that the hot water will have no difficulty in returning to the water tank. To obtain the full benefit of a water tank the bottom of it should be set on a level with the engine cylinder. Frequently if the water used contains much lime etc., there will be considerable deposit in the water jacket spaces so that once or twice a year this must be cleaned out. We must see that the cylinder is properly lubricated, not too much or too little. If too little lubricating oil is given, the piston will expand and stick in the cylinder. If too much is fed, the surplus will stick to the piston rings, valves, etc., as well as fill up the exhaust port and muffler. We must see that the piston end of the connecting rod is properly adjusted to take up wear and yet it must not be too tight. If it is the piston will jump up and down in the cylinder and cause considerable wear in a very short time. The crank shaft end of the connecting rod must likewise be properly attended to, in order to keep the wrist from becoming too hot, prevent undue wear, etc. The main bearings must be lubricated properly, as well as the other bearings, etc. The governor must be kept in proper adjustment and lubrication for on it depends the steadiness of the speed. Once in a while a governor is so designed that if anything gets out of adjustment or breaks, the engine runs away. This is the wrong principle, as it should be so designed that if anything goes wrong the engine will stop. Engines frequently do stop without any apparent cause, but really because something in the governor is out of adjustment. Perhaps one of the bevel gears may get loose, or something of that kind.

Mention has already been made of the fact that water condenses in the exhaust pipe on cooling. Frequently water will condense inside the cylinder and cause trouble in starting. In cold weather this water may run around the valve seats and freeze them tight during the night, causing the valves to stick when starting. This sometimes results in a part of the valve cage or the mechanism operating the valve being broken. The valve stems should be tapped lightly in order to loosen the valves from the seats before attempting to start.

Often, where a water pump is attached to the engine, it may freeze slightly during the night and may break if not warmed up with a torch before attempting to run.

As was referred to while discussing the subject of fuel supply, the operator should study and understand thoroughly the device on his engine for carrying the gasoline from the pump into the cylinder proper. These devices cause a great deal of trouble from the fact that operators do not understand them and keep them in adjustment or clean. Generally speaking, these devices are the most delicate about the engine with the exception of the igniter.

In a great many cases they are very complicated, in which case they will require all the more study and attention. But even with the simplest devices care must be taken to keep dirt or other substances out of the apparatus. Many times a small string of waste will get caught in it while the operator is wiping up the engine and this will frequently partially or entirely stop the supply of gasoline.

Engines which have packing joints sometimes cause trouble from leaks in the packing. The best material to use for such joints is asbestos board, one-sixteenth of an inch thick, cut to shape and soaked in boiled linseed oil. If in a hurry and unable to secure the linseed oil, soap well the asbestos board. This will do nearly as well as if soaked in oil. On putting them on, if the flange or head is placed on by several bolts, do not draw one bolt clear up before straightening the others. Draw up one bolt fairly tight and then another, and so on, tightening each one a little in succession. This will give an even pressure all around and prevent springing the parts. The same process should be followed in screwing in valve cages, where they are secured in this manner.

These are only a few of the points that might be mentioned. In addition, there are many features peculiar to each make of engine and these peculiarities must be studied by the operator so as to know what to do in case of trouble. Gas and gasoline engines are, to a very large extent misunderstood in two different ways. Some people look on them as so very simple that anyone can run them and it does not matter whether the engine is cared for or not. The other class of people regard them with awe as a sort of mysterious and unexplainable machine which no one but the manufacturer can understand. Each class is wrong. They represent the extremes, of which the mean is about correct. Gas engines, like all machinery, need attention in order to prevent excessive wear and to keep the parts in such adjustment that they will give the best results in efficiency and economy. But they are not unintelligible to a man of ordinary intelligence, who is willing to study them and learn why each part moves as it does and at a certain time. Perhaps the most mystifying thing to the observer of a gas engine, unless he understands it, is to see some part make a jump now and then, apparently without any cause or justification. But when he understands the operation of the engine and knows that that particular part of the machine makes the movement at certain intervals, regularly or irregularly, because of certain well-understood reasons, he then begins to understand the wonderful ingenuity of the gas engine designer, which enables him to make a machine which will seem to have almost human intelligence. No wonder that the gas engine enthusiast is continually striving to initiate his fellow-men into the wonders of this machine. No wonder that he strives to have his fellow-operators study their engines and see the reason for the mysteries and become, like himself, an enthusiast! No wonder, when he sees an engine abused and ill-cared for, that he uses strong language in his endeavor to arouse the operator to the necessity of knowing his engine! Gas and gasoline engines are destined to be one of the greatest sources of power in this century. They are already displacing steam engines by the hundreds. They are used for every conceivable purpose from furnishing power for factories and electric light plants to running yachts and automobiles. Like all machines operating under principles which are not well understood by the ordinary public, they have been abused and have therefore been blamed for the trouble which was caused really by the lack of understanding on the part of the operators, but as knowledge of their princples of operation is spreading, they are continually growing in favor.

It has not been intended that all the suggestions made will be needed by every operator of a gas engine, nor are so many suggestions given with an idea of confusing the operator by their number. Each operator has his own particular difficulties and while he may thoroughly understand some parts of his engine, others may still be difficult for him to understand. I have therefore attempted to impress on the mind of the operator the necessity of studying his engine and in attempting to locate difficulties not to proceed in a purposeless way, but in a methodical manner which will lead to a solution of the difficulty in much shorter time than by guessing here and there.

Talbot's New Process of Steel Making.

BENJAMIN TALBOT, of Pencoyd, Pa., has patented an improvement in the art of manufacturing iron or steel. It consists of removing carbon very rapidly from molten iron or steel charged into an open-hearth furnace and producing a large volume of carbonous-oxid flame or raising the furnace-chamber and the regenerators connected to a high degree of heat, the carbonous-oxid gas evolved burning in the furnace-chamber and the excess or gas unconsumed burning in the regenerator. The result is an economy in fuel and operation.

A furnace connected with regenerators is pre-heated and provided with an initial bath of molten iron or steel purified and covered with slag containing metallic oxid capable of removing carbon, such as oxid of iron or manganese in sufficient proportion to rapidlv oxidize the carbon contained in the liquid iron or steel to be treated. The metallic oxid in the slag should preferably be in excess of that required to oxidize the entire carbon contents of the metal to be purified to produce the most satisfactory results. The oxidizng character of the covering of slag is maintained by drawing off portions as the same becomes exhausted and enriching the remainder by additions of mill-cinder, scale, or iron ore and lime or limestone as required. The higher and more uniform the proportion of oxid maintained in the slag relative to the carbon contents ot the successive charges of molten metal poured, the more rapid and uniform will the be revolution of carbonous-oxid gas and flame, the higher and more uniform the temperatures maintained, and the shorter the time involved in the reduction of the impure charges. The heat evolved in the operation supplements the effect of the fuel-gases which are employed as in the ordinary practice and has been found to greatly increase the output per unit of plant and to produce a better quality of metal. The operations are preferably carried on continuously.

In building up a charge of metal in a fixed open-hearth furnace a small bath of pure metal is formed in any usual manner (say twenty to twenty-five per cent of the furnace capacity) with a covering of oxidizing-slag, and the furnace is then filled by means of repeated small additions of impure metal. An interval of time is allowed between the successive additions of metal during which oxids are added in order to maintain a positive oxidizing-slag, so that the bath may be sufficiently purified before the subsequent addition of metal is made. The lower the bath is in metaloids the quicker will the carbon be removed from the fresh liquid metal addition. When it is desired to retard the removal of carbon, as where it is necesasry to remove phosphorus from the liquid bath, solid pig-iron containing carbon with but little phosphorus may be charged into the bath, since it lowers the temperature and is not so rapidly purified as in case the addition is of liquid metal. Slag is removed when necessary during the building up of the charge or after the furnace is filled. This method of building up the charge is continued until the quantity of purified metal is obtained, the furnace being then tapped and the operation repeated. It will be understood that the metal thus treated may be either iron or steel containing an excess of carbon, by which is meant carbon which should be removed in the process of treatment to produce the final product desired or which may be removed as an agency in the process of treatment. The metal to be treated may be wholly unrefined or partially refined—as the products of the blast furnace, Bessemer mixed, reservoir, or other furnace—and may contain in addition to the carbon content silicon, phosphorus, sulphur, or other impurities the removal of which is greatly facilitated by the high heat developed from combining and burning the oxygen of slag and the carbon of the metal treated. It is not essential that all the carbon of the metal in process of treatment should be exhausted, it being in some instances desirable to retain a portion in the bath and in the metal drawn therefrom—say fifteen one-hundredths of one per cent—the product being either wholly refined in the furnace or partially refined and finished by subsequent treatment.

For the most rapid and satisfactory evolution of carbon and purification of meta the liquid steel bath should, however, be as low as possible in carbon content, down to traces, the evolution of carbon from the added charges being most rapid when the bath is in substantially purified condition.

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Increasing Use of the Metric System.

THE metric system is slowly but surely creeping into popular favor in the United States.. There will not need be any enactment of legislation to force an adoption of the system which has been adopted by a majority of the countries of Europe. A history of the metric system is given elsewhere. Its adoption a midst the stormy scenes of the French revolution by the greatest school of scientists then in existence is a lasting monument to the Academy founded by the French and supported by the French kings.

The metric system has been adopted by more concerns in the United States than the average laymen can conceive.

The "United States Pharmacopeia," the reference manual of the apothecary, is exclusively metric. "The Dispensatory," the corresponding manual of the physician, has metric values throughout. The use of the metric system was introduced in the United States Marine Hospital service about a quarter of a century ago quite thoroughly, and in the army and navy more recently. In practice in civil life prescriptions are to a large and increasing extent written in metric terms. In the sale of high grade chemicals the metric system has been introduced. E. R. Squibb & Sons, of Brooklyn, have used it exclusively for nine years, and the Bausch & Lomb Company, of Rochester, issues a sixty-page priced catalogue "G" of "Chemicals and Reagents" in metric terms, with a conspicuous notice at the top of each page, "Prices of Chemicals are by Metric, NOT Avoirdupois Weight." Much glassware and rubber stoppers are made to metric scale. As to chemical manufacturing, all the tanks in the factory, built by the Merrimac Chemical Company, of Massachussetts, for their extensive sulphuric acid works, were made on metric dimensions, and the Pennsylvania Salt Manufacturing Company has built a large plant entirely upon metric dimensions. The great Solvay Process Company, of Syracuse, makes use of the metric system in every possible way in its works. Drawings to go outside of the works for construction, etc., are not made in the metric system. The company says it finds no disadvantages, and would be very glad if its entire works could be operated upon the metric system.

Chemical analyses are expressed in parts per million, per hundred or per thousand, corresponding to grams per cubic meter, per hectoliter or per liter. Grains per gallon are out of date.

The metric measure has been extensively used in precise leveling or other work of the United States Coast and Geodetic Survey, the United States Geogical Survey, the United States Lake Survey, and the Survey under the Mississippi River Commission.

The following order was signed by John G. Carlisle in 1893, then Secretary of the Treasury.

"The office of Weights and Measures, with the approval of the Secretary of the Treasury, will in the future regard the international prototype meter and kilogram as fundamental standards, and the customary units, the yard and the pound, will be derived therefrom in accordance with the act of July 28, 1866. Indeed, this course has been practically forced upon this office for several years."

The April, 1900, report of the American Railway Association's Committee on the Metric System enumerated among manufactures in which the metric system has been introduced watches, injectors, refrigerating apparatus, screw-cutting lathes, scales, drills, gauges, astronomical and physical instruments, measuring implement

and draughtsmen's supplies. We have exported to metric using countries a great deal of ordnance and machinery for manufacturing ordnance, and rapid-firing guns have been designated by their caliber in millimeters. The Baldwin Locomotive Works' illustrated catalogue of narrow-gauge locomotives has printed on its title page. "Adapted Especially to Gauges of 3 Feet 6 Inches or One Metre," and on each of the sixteen pages (108-38), on which are tabulated various types of locomotives, has printed conspicuously, "Gauge 3 Feet 6 Inches, or One Metre." The Library Bureau, of Boston, has cards and cases made of exact metric dimensions.

The metric system is forcing itself into use just the same as it did in the United States Treasury Department.

Thousand-ton Blast Furnace Here.

THERE has been much speculation as to whether blast furnaces will be built to produce 1,000 tons of pig iron every 24 hours. The furnace of that capacity is here. One of the Edgar-Thomson furnaces rceently produced 967 tons of pig iron in the alloted time and it is only a question of a few months until one of the mammoth furnaces produces 1,000 tons. These furnaces were built to produce 600 to 700 ton per day. The production of pig iron is not dependent on the size of the furnace so much as on the heating capacity.

The extension of hot blast stoves, and the utilization of the gases, together with a better knowledge of the iron ore properties has made it possible to produce 900 tons of iron in a 700 ton furnace. The fact that the gases in the new furnaces are not allowed to escape as formerly, but are confined in the furnace during the loading of the same, increases the heating capacity of the furnace to a great extent.

It has been intimated that the large blast furnace is a failure and will have to be razed or the production reduced because of the loss in iron ore. It is said that the ore sifts through the air being blown out by the blast pressure. It is doubtful if this item will cause the condemnation of the large blast furnace, in fact, the blast furnace has not reached its greatest proportions. The economy of operating a large furnace is too great to allow such a small matter as the wasting of a few tons of ore to interfere with operations. Some invention will be brought forward to overcome this waste and the blast furnace will continue to grow. In the meantime it is almost certain that the large stacks now working for records will soon produce 1,000 tons.

Hand Punch for Cold Metals.

A USEFUL hand punch has been patented by Henry C. Tvebaugh, of Hondo, Texas. the implement being designed to be used in punching cold metal in blacksmith and machine shops. A base is provided comprising a long arm having at one end a die, and at the other a hinged ear. This base can be supported by an anvil or secured to a table. Hinged to the ear is another arm carrying at its free end a movable male die that co-acts with the die of the base. This hinged arm is supported by a spring, secured to the base. Rising from the base is a slotted standard that embraces the pivot arm so as to constitute a guide and within this standard above the arm is pivoted a clamping lever having link connections with the arm, so that when the lever is pressed downward, the movable die will be brought down upon the material placed upon the base, clamping it in position. This movable die is provided with an upstanding head adapted to be struck by a sledge or hammer, thus driving the same through the metal or material placed upon the base and punching an opening in the same.

CHRISTOPHER ZUG.

"Slave to no creed, he takes no private road,
But looks through nature up to nature's God."

Christopher Zug, the founder of the firm of Zug & Company, and the oldest iron manufacturer of the world, both in years and point of active connection with the industry, died at his home, Center and Negley avenues, Monday morning at 10:45. Mr. Zug was almost 95 years of age but up to three weeks ago was in good health with an active mind that still retained an interest in the business of his firm and all other topics of general interest.

From time to time after his retirement from active work, Mr. Zug continued to make calls at the office of Zug & Company, a name synonymous with "Sable Iron." up to about three weeks ago. After returning home from the office he showed unmistakable indications of fatigue that led rapidly to physical collapse. He failed to rally from the weakness and steadily declined. Monday morning he felt that the end was at hand. He called his son Charles to his bedside and told him that his long life was at an end. Atfer short talks with those who were about him Mr. Zug composed himself for a sleep which he knew was his last slumber and in which his spirit passed from earth.

Christopher Zug was born on a farm in Cumberland county, Pa., July 19, 1807, the son of Jacob and Margaret Keller Zug, both residents of Lancaster, at the time of their marriage. His only school advantages were surrounded by that peculiar character so common to educational movements more than 80 years ago. His first business occupation was as a clerk in the store of Benjamin Childs, at Carlisle, changing two years later into mercantile pursuits in company with his cousin, Jacob Zug. That partnership continued two years, and the succeeding three years were spent in the brewing and distilling business. Then he came to Pittsburg and became a clerk in the hardware store of S. Fahnestock & Company, and subsequently with the Birmingham Iron Works, owned by Hoag & Hartman. Later Mr. Zug was the book-keeper for James Anderson, operating the mill on the site of Mr. Zug's present plant. In 1845 he was admitted into the firm of Graff, Lindsay & Company, composed of Henry Graff, John Lindsay, William Larimer, Jr., and Christopher Zug. This firm bought the Lippincott Works from James Anderson and changed the name to the Sable Iron works which in 1854 became Zug, Lindsay & Company. The new firm bought the Pitsburg Iron Works from Lorenz, Stirling & Company, with which Jacob Painter was connected. John Lindsay died in 1856, and Messrs. Zug and Painter became the owners, but in 1864 this firm was disolved, Mr. Painter taking the Pittsburg Iron Works, and Mr. Zug retaining the Sable Iron Works. Mr. Zug admitted, as a partner, his son, Charles H. Zug, the firm name changing to Zug & Company, which is still retained.

Mr. Zug. was married May 17, 1831, to Eliza Blair of Hanover, Pa., who died December 9, 1863. To them were born five daughters and one son, of whom three daughters, Mrs. James H. Parker, of Chicago; Mrs. Edward Burdett, of New York; and Mrs. Thomas C. Clarkson who made her home with him; and the son, Charles H. Zug, survive. Mr. Zug comes of a long-lived family, his father reaching to within a few months of a full century, and his mother passing her ninety-fifth birthday. All of his brothers and sisters lived to be more than 70 years of age.

IN AND ABOUT PITTSBURG.

Work on the new tinplate plant of the McKeesport Manufacturing Company, in Port Vue, will be started within a few weeks. Samuel Diescher & Sons, of Pittsburg, have been employed to superintend the construction. The plant will stand on a plot of 13 acres of the Youghiogheny and will consist of hot and cold mills, each 75 feet by 400 feet. The annealing furnace and gas generator building will be 25 feet by 200 feet and the pickling department will be 25 feet by 400 feet. The furnaces will be 25 feet by 300 feet and the tinning house, with a capacity for 24 tin stacks, will occupy a building 75 feet by 600 feet. In this will also be the sorting room and stockhouse. The equipment will be modern. The plant will have ten mills with a minimum capacity of from 35,000 to 40,000 boxes per month. The plant will be reached by the Pittsburg & Lake Erie and Baltimore & Ohio railroads and will be ready for shipping tin plate in eight months. The stockholders are E. P. Douglass, J. C. Smith, Dr. J. W. Fawcett, Dr. E. T. Nason, G. F. Meyer, R. T. Carothers, E. R. Crawford, J. E. Lauck and E. W. Pitts, of McKeesport, and William Curry, of Pittsburg.

During the past 10 days the H. C. Frick Coke Company, which operates all of the coke properties of the constituent companies of the United States Steel Corporation, has contracted for the sale of nearly 100,000 tons of blast furnace coke at $2.25 per ton. No prices for delivery beyond 30 days are made on foundry coke, owing to the demand and the car shortage. Some foundries are now paying premiums for coke for immediate delivery. Prices of the makers, however, are $3.25 per ton. The Frick Company is considering the advisability of closing several thousand of its ovens temporarily, owing to the fact that about 125,000 tons are stocked at the different plants and the piles are now encroaching on the oven space.

The Champion Rivet Company, an old established corporation of Cleveland, has bought nine acres of land at Parnassus, and will build a plant at a cost of about $300,000, and eventually its entire works will be moved to that place from Cleveland. Wilson B. Chisholm is president of the concern, W. C. Winterhalter secretary, and a number of Pittsburgers are interested.

The Hope Manufacturing Company, Hope street, Allegheny, has secured the quarters formerly occupied by Nuttall Brothers, on Park Way. The demands of the Hope company's business required larger space and the new location will allow a contemplated increase of four times the present capacity.

The stockholders of the James H. Baker Manufacturing Company, of Tarentum, have voted to increase the capital stock $15,000. It was also decided to enlarge the works of the company to about double its present capacity. When this is done the plant will give employment to about 200 men and boys. James H. Baker was elected president and general manager of the company, Henry M. Brackenridge treasurer, and O. C. Camp, assistant treasurer. A. E. Armstrong, for the past 25 years connected with the railroad shops at Verona, was appointed manager of the factory.

The Budke Iron & Manufacturing Company is being organized by Senator Bukde, of Canonsburg, with others. The company will be capitalized at $800,000, having for its purpose the erection of a plant near Shannopin station, on the P. & L. E. R. R., for the manufacture of sheet iron and steel. The plant will consist of five buildings, all of which will be thoroughly equipped. Ground has been secured at the above named location and as soon as the company is thoroughly organized preparations will be made for building the works.

Contracts will be awarded by Chief Engineer J.A. Atwood of the Pittsburg & Lake Erie within a few days for improvements at McKee's Rocks to cost about $500,000. Most of the work will be the erection of new buildings. One will be a large roundhouse and another a paint shop. Other shop buildings are included in the scheme. Larger yards at Glassport and many more miles of siding are also among the additions contemplated for the immediate future.

The Sharon Steel Hoop Company will shortly begin work on additions and improvements to the plant that will cost about $1,000,000. The company intends to build its own open hearth steel plant and two additional mills for the manufacture of steel hoops and cotton ties, more than doubling the present capacity. Up to the present the company has received its supply of steel from the Sharon Steel Company.

Sharpsville is to be the location for a new steel mill. The projectors are S. A. Robinson, Andrew Nickle, W. V. and H. W. Robinson all of Sharpsville. Application for a state charter will be made February 6. The company will be known as the Riverside Iron Company. The concern controls patents on a new process which will, it is stated, reduce the cost considerably.

NOTES OF THE INDUSTRIES.

Pittsburg capitalists have interested themselves with Wickwire Brothers and will build the largest rolling mill in New York to resist the attacks of the wire combination. Wickwire Brothers had a wire plant at Cortland, and when the wire combine was formed declined to enter the organization. An effort was made to crush them, which acted inversely, for the plant has grown rapidly from a small concern to an institution employing 800 men. With the association of Pittsburg capital the contract was let for the construction of a big steel frame rolling mill which will turn out the steel billets used in making the wire and will double the capacity of the works. The contract which has been let to the Wellman-Seaver Engineering Company of Cleveland, calls for completion of the plant by September 1, and work will begin as soon as the frost is out of the ground.

The last step in the formation of the pneumatic tool combination was the filing of a deed of trust for $2,500,000, in the county recorder's office at Cleveland, January, 15. The deed was from the Chicago Pneumatic Tool Company to the Central Realty Bond and Trust Company, of New York, to secure the payment of $25,000,000 issue of 10-year first mortgage 5 per cent gold bonds. The plants of the Boer Machine Company, of Detroit; the Olney Metal Company, of Philadelphia; the Chisholm & Moore Manufacturing Company, of Cleveland; the Franklin Air Compressor Company, of Franklin, Pa., and 20,000 shares of the New Taite-Howard Pneumatic Tool Company, of London, England, with all the patents of the concern, are included in the securities.

The brokerage firm of E. D. Gartner & Company, of Pittsburg, bought the Keystone Fire Clay Company, of Lisbon, O., the Union Fire Clay Company, of Coleman, and the Furnace Fire Clay Company, of Salineville, the firm acting merely as brokers in the deal. It is understood that the three works are to be operated by the same management. The Keystone works have been idle for some time, but opened under the new management Monday. The works are to be enlarged to more than double their present size.

President A. E. Stilwell of the Kansas City, Mexican & Orient railroad, announces that Chief Engineer N. P. Pratt has sailed for home after having arranged for the shipment of 600 miles of rails for the Orient line in Mexico, which were bought and paid for by the Mexican subsidy. The rails were bought to be delivered at Port Stilwell and Tampico at about $10 per ton less than the lowest price obtainable from American mills. They will come from Belgian manufacturers.

As a result of the bi-monthly examination of the bar iron sale sheets held at Youngstown by representatives of the Amalgamaedt Association of Iron, Steel & Tin Workers and J. H. Nutt, head of the labor bureau of the Republic Iron & Steel Company, the wage rate for puddlers for the 60 days beginning January 1 will be $5.75 per ton, an advance of 25 cents per ton, and the rate for finishers 6.5 cents per ton, an advance of 2 per cent per ton.

Employes in the mills of the American Steel & Wire Company at Anderson, Ind., are badly disturbed over a notice, posted late last week, that there will be a reduction in wages among the employes, who have been receiving 16⅔ cents an hour. From January 15, according to the notice, they will be paid 15 cents an hour. Recently another half hour was added to the day, which is now 10 hours and a half.

With the lighting up of the Struthers furnace January 11 every Mahoning stack, for the first time in three months, will be in operation, many of them being compelled to bank for longer or shorter periods by reason of the coke shortage. Coke is now being received from Virginia, with a limited supply from Connellsville.

The Ironsides Company, of Columbus, O., which manufactures special lubricants for wire ropes, gearing, belting, fiber ropes and metallic surfaces generally, reports recent extensions in productive equipment which doubles the former capacity. The company reports business in flourishing condition.

The mill of the Maryland Sheet Steel Company, Cumberland, Md., which was the old Crucible steel plant, purchased for $65,000 by Cumberalnd investors, started Monday morning working three mills. When the open-hearth furnace and the blooming mill are started the force will be 200 men.

The foremost financial authority in Germany, the "Frankfurter Zeitung," announces that the steel makers of the empire are forming a combination to include all branches of the steel industry. German concerns have received orders through London for 25,000 tons of spiegeleisen for American account.

It was announced at New York, January 8, that the United States Steel Corporation will be awarded the $20,000,000 contract for structural iron for the Long Island tunnel of the Pennsylvania railroad.

IRON AND STEEL TRADE,

PRICES AND CONDITIONS.

PITTSBURG—The slight improvement in the car supply during the week is the only new feature of the markets but it was sufficient to give much better color to the situation. The mills and furnaces report the best supply of cars for months and with the same conditions or better the production of raw and finished material will be considerably more rapid.

The sale of 100,000 tons of Bessemer pig iron to the companies of the United States Steel Corporation at $15.75, at valley furnace, was the first big movement in that directon. The sale covers the capacity of the associated furnaces up to July and makes certain that at least during that time the rate on current sales of Bessemer will not fall below $16.00 at furnace with the indications that the occasional rate of $16.25 per ton will more than probably influence the few small sales that will run up to the middle of the year. The question with the furnace men now is how they are to get out the tonnage contracted for within the time. It is stated that if the coke supply continues good, that is relatively good, say as sufficient as during this week, the tonnage will be handled without inconvenience.

There is a slightly easier feeling as to billets although plants are still making shipments on last year's contracts. From what is known the old contracts will not be worked out for some weeks even at the present rate of shipment. If the cars were available the shipments would be rushed and the old contracts wiped out in a short time.

The foundry grades of pig iron have also been advnced 50 cents per ton with the general capacity of the country North and South covered for the first six months of the year.

A good tonnage of mill iron was sold during the week at the high rate of $16.25, Pittsburg delivery which is a clear gain in that branch of products.

In the finished lines the shipments have been improved by the better car supply but the old contracts still hang on. The question is not of business as of shipments.

CURRENT QUOTATIONS:

Basic	$16 25	16 50	Splice bars	1 50	
Bessemer	16 75	17 00	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy. Shn		17 00	Z beams	1 60	
Fdy 2, Shn		16 75	Channels	1 60	
Fdy 3, Shn		16 50	Boiler plates	1 75	
Mill iron	16 25		Fire-box	1 85	
Fdy 1, Shn	16 65		Sheared	1 65	1 75
Fdy 2, Shn	16 40		Tank	1 69	1 70
Fdy 3, Shn	15 65		Steel melt'g scrap	14 00	
Grey Forge, Shn	15 10		No. 1 wrought	15 50	
Bessemer billets	27 50	28 00	No. 1 cast	13 00	13 25
Open hearth	29 00	30 00	Iron rails	21 50	
Steel bars	1 60		Car wheels	17 50	18 00
Iron bars, refined		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Bolts, iron, sq nut	2 50		Sheets, 26	3 00	
Hex nuts	2 65		Sheets, 27	3 10	
Standard sections	28 00		Sheets, 28	3 20	
Spikes	2 00				

PHILADELPHIA—The first week of the new year witnessed a renewal of buying for nearly all forms of iron and steel and the situation grows stronger day by day. Buying has not been prompted so much by fear of higher prices, although of course, there is danger of this, as by a desire to get prompt material there is no doubt that most of the furnaces and mills will be crowded to their utmost manufacturing and shipping capacity during the first half of the year. At the present time the matter of deliveries hinge much more on shipping facilities than on producing facilities. The transportation difficulties continue to be a great annoyance to the trade. Furnaces are still verv much handicapped by the lack of coke, and there is probably not a furnace which had not more or less difficulty. Those best situated have had to bank for only a few hours at time, while others have had to take the blast off for a week at a time. Production is being seriously affected, and will be for some time. This has stiffened the pig iron market materially. Manufacturers of other products are also greatly hampered by the car shortage, as material can neither be brought in nor shipped out in sufficient quantities to meet their daily requirements. Some railroads profess to have gotten better control of their service, but the effect is not yet appreciably felt. It is probable that a little more coke is going into the furnaces in Pittsburg and the valleys, but, on the other hand, as high as $3.50 is being paid by furnace operators for coke, when the regular price is only $2.25, in preference to shutting down.

Pig iron prices in the local market have advanced 50 cents to 75 cents per ton during the past two or three weeks. Whether they will now settle or not remains to be seen. No. 2 foundry iron for prompt shipment is to-day quoted at $16.50 to $17, with a number of sales reported on this basis, and it is probable that more money will be asked before next week.

For long dates buyers are not yet prepared to pay materially higher prices than are quoted.

Today's prices of steel billets are firm, $29 to $30, and buyers find great difficulty in securing prompt deliveries even at these figures.

The demand for finished iron and steel is increasing, and prices all along the line are firm. Those mills making a specialty of structural material never were probably so busy as at the present time, and orders are coming in in larger volume than shipments are being made. The bar market has shown considerable improvement during the week. There have been a number of reports of weakness in the price of sheets, but, as a matter of fact, the only development so far has been that the independent mills have been going actively for tonnage, and have been meeting the prices of the American Sheet Steel Company. Tonnage in plates has increased considerably, and the outlook is that business will increase right along.

There is a notable reflection of the strength of the general market in an incident in the steel rail trade. In seeking to place an order of 105,000 tons of rails the Mexican Central Railroad could get no American bidders at the prices now ruling. The contract is understood to have been placed in England. Standard sections continue to be quoted at $28 at mill.

CURRENT QUOTATIONS:

Foundry, 1	$17 25		Girder rails	32 00	32 50
Foundry, 2	16 50	17 00	Angles, 3" & lr'gr	1 75	1 80
Gray Forge	16 00	16 50	Under 3-inch	1 85	1 90
Bessemer billets	29 00	30 00	T's 3" and larger	1 80	1 85
Open h'rth bil'ts	30 00	31 00	Under 3-inch	1 85	1 90
Steel bars	1 70	1 80	Heavy plates	1 75	1 80
Refined iron bars	1 90		Beams and chanls	1 75	1 85
Standard rails	28 00				

NEW YORK—The troubles surrounding the pig iron situation are by no means lessened. The transportation problem has improved slightly at some points and grown worse at others. A large number of furnaces in the aggregate are still banked for lack of fuel. New difficulties, however confront manufacturers. Scarcity of labor in mines and at furnaces is beginning to be felt. The frequent shut-downs and uncertain supply of raw materials, have run up cost in many districts until the situation of the maker is worse than it was before the improvement in prices commenced.

Blast furnace men call attention to the fact that prices of pig, instead of being inflated, as some have supposed, are very low, taking cost of materials and transportation into account, and scarcely yield as much profit as was realized before the advance. Prices are 30 per cent lower than two years ago and are but slighlty higher than a year go.

The scarcity of metal for prompt or nearby delivery grows more pronounced. Furnacemen try to accommodate as far as possible, and are not taking advantage of the situation to extort high figures. There is good reason to expect, however, that the next thirty days will bring home to many consumers the realization of what up to this time has in some quarters been discounted as the talk of sellers for market effect.

CURRENT QUOTATIONS:

No. 1X fdy Sohn Jersey City	$17 25	
No. 2X fdy Jersey City	17 00	
No. 2 plain Jer. C.	16 65	
Sohn. 1 fdy N. Y.	17 50	
No. 2 fdy N. Y.	17 25	
No. 3 fdy N. Y.	16 50	
No. 1 soft	17 50	
No. 2 soft	16 00	
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40
Sheets, blue annealed, 10	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00
Plates ¼ and heav	3 15	
Ship & tank plate, on dock	2 50	2 50
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10	
Beams and chan'ls 15-in & under	2 00	2 50
Angles	2 00	2 50
Tees	2 00	2 50
Zees	2 00	2 50
Time deliveries, basis $1.75 for angles, beams and channels,		
Com. base, bars per 100 lbs.	1 85	1 90
Refined base, bars	1 90	2 00
Bands, base	2 40	2 50
Norway bars	3 75	
Norway shapes	4 25	
Old T rails, iron f. o. b. cars	19 00	20 00
T rails steel f o b c	16 00	17 00
No. 1 wro't scrap iron f o b cars	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes	13 00	14 00
Old car wheels, f. o. b. cars	16 00	17 00
Old ham. car axl's f. o. b. cars	22 00	23 00
Wrought turnings deliv. at mill	9 00	10 00

CINCINNATI—The orders of the past week have been for deliveries from the immediate future to the last of the year. The great tonnage has been principally for April and beyond. There are no indications of a lessening of the consumption.

The enormous tonnage on the books establishes the price current on raw and finished iron and steel for at least six months and not unreasonably for th entire year. There is a great shrinkage of furnace output, owing to shortage in coke cars, and other hindrances, and they have been suffering more than the foundries.

The week has been one of activity in iron in this market. Orders have been freely booked for the third quarter of the year, and a heavy tonnage has been placed for the last half. Inquiries are numerous, and there seems to be no indication of a wane in the buying movement. Sales, however, have been mostly confined to foundry, basic, and malleable irons. These are at the advanced prices as given last week.

The prospects are for advanced cost in obtaining ores and for transportation. The situation in manufactured iron and steel argues for a strong, well maintained market, throughout the entire year. New business in sheets is plentiful, though the mills seem to make no progress in catching up on delayed deliveries. All the structural plants report excellent demand for material, and plenty of business. The tonnage in

bars, and plates amounted to a good aggregate during the week, and the outlook is for a continuance of it.

The summing up is that this market for iron is strong. Several good lots were sold last week, mostly foundry grades 2,and 3; soft forge, and 4 foundry found ready sales. One concern bought 2,500 tons of the different brands, and grades. Advance prices went into effect on Monday of this week.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$15 50	Steel hoops.	1 95	2 50
South fdy. 2	14 75	15 00	Sheet, 26	3 50	
South. fdy. 3	14 25	14 50	Sheets, 27	3 85	3 85
South. fdy. 4	13 75	14 00	Sheets, 28	3 45	3 95
Grey forge	13 75	14 00	Angles, 3 to 6 in	1 75	2 50
Mottled	13 75	14 00	Angles, 1¼ to 2½	1 75	2 50
Shn. 1, soft	15 00	15 25	Beams and Chanls 15 in and under	1 75	2 70
Shn 2, soft	14 50	14 75	I b'ms 18, 20 24 in	1 80	1 50
L. Superior, fdy. 1	15 25	15 50	Tees	1 75	1 85
L. Superior, 2	14 75	15 00	Z's	1 70	1 80
L. Sup'r char'l c w	19 00	19 50	1 wrought scrap	12 0	13 05
Hang'g r'k ccl, 1	18 00	18 25	Steel mlting stock gross ton	11 50	
Sohn ccl c w	17 25	17 50	No. 1 cast	11 00	
Jaksn cy. silv'y 1	15 .0	15 75	Old iron rails g t'n	15 00	
St'l brs base hlf ex	1 75	1 90	Old car wheels	14 50	
Iron bars	1 75	1 90	Cast borings	5 00	
Flange plates	1 82	1 92	Turnings	5 50	
Tank steel	1 72	1 82			
Ordinary fire-box	1 92	1 97			
T rails	36 00				

CHICAGO—Premiums ranging from fifty cents to $2 have been paid within the past few days for prompt shipments of local or Northern pig ron. Nominally the price of No. 2 foundry is $15.50 but the large producers have had none for sale for many weeks and great scarcity has ensued. Ohio brands at $15.50, furnace, or about $17.50 Chicago, have had a fairly good run for some time past. There has been good buying of pig iron this week for deliveries during the last six months of the year. Among buyers are some of the largest local consumers 15,000, or more tons having been placed in four or five transactions. with more business of the kind in sight. Southern irons are scarce and firm.

Demand for finished product is in every way satisfactory. The buying denotes a steadily large consumption. Both small and large producers are sharing in the activity, which extends to all branches of the trade. Even rails, which have been weak for several weeks past, are meeting with almost unprecedented demand for January. It is all in small lots but the aggregate is large. Railways continue to ask for rails and are obliged to accept specified dates of delivery at the extreme end of the season. Bars are a favorite article of commerce and some producers, sold up for months, are disinclined to book any more business at present. Old material is scarce. Demand seems fitful, and large consumers are not active buyers. Prices continue the subject of decided difference of opinion between buyer and seller, which in case of scrap held by dealer tends to restrict trade.

CURRENT QUOTATIONS:

Bessemer	17 50	18 00	Sheets, 26 store	3 15	3 25
Fdry Nohn 1	16 00	17 00	No. 27	3 25	3 35
Northern 2	15 50	16 50	No. 28	3 35	3 45
Northern 3	15 00	16 00	Angles	1 75	
Southern 1	16 15	16 40	Beams	1 75	
Southern 2	15 65	15 90	Tees	1 80	
Southern 3	15 15	15 40	Zees	1 75	
Forge	14 65	14 90	Channels	1 75	
Charcoal	19 00	20 00	Steel melt'g scrap	13 50	14 00
Billets, Bessemer	30 00	32 00	No. 1 wrought	15 00	15 50
Bars, iron	1 65	1 70	No. 1 cast, net ton	12 00	12 50
Bars, steel	1 65	1 70	Iron rails	21 00	22 00
Rails, standard	28 00		Car wheels	16 00	17 00
Rails, light	31 00	34 00	Cast borings	5 00	5 50
Plates, boiler	1 90	2 00	Turnings	9 50	10 00
Tank	1 75	1 80			

BIRMINGHAM—Experts say that the Southern iron and steel market is in better trim than they have ever known it. Sales of spot iron are not heavy because it is impossible to secure it, the furnaces being pledged to their utmost capacity for months to come on orders booked for some time.

What spot iron is sold is taken on a basis of $12 per ton for number two foundry. Many orders are being booked for fall delivery. The furnacemen are taking the situation easily and are making no special efforts to increase production immediately, their attention being still devoted to the enlargement and repair of furnaces. The Talladega furnace will go in blast this week after having gone through thorough repairs. The Lady Ensley furnace, at Sheffield, is also undergoing repairs. The building of new industries is going on steadily and with attention to details so that they will be in prime condition when they do start rather than hurry into operations without full preparation.

The car famine appears to have eased up considerably, but there are not enough cars yet to move all the freight offered. The year has turned with every metal field in good form and the indications are for the steadiest as well as most successful run of industries the Southern field has ever faced.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 00	12 50	Tank	1 80	
No. 2 fdy, Sohn	11 75	12 00	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 00	11 25	No. 1 wrought	14 00	
Grey forge, Sohn	10 50	10 75	No. 1 cast	12 00	
Billets	26 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 0	3 50
Boiler plates	1 90		No. 28 sheets	3 10	3 50
Fire box	2 00				

In these days of organization of large manufacturing interests, the ownership of such property is becoming more and more thrown into the shape of stocks and bonds.

Pittsburg is becoming not only the center for the manufacture of iron and steel, but is growing in importance as a place for the sale of iron securities.

Robert C. Hall, member of the Pittsburg Stock Exchange, will be pleased to give any information possible at any time concerning these securities, or make transactions therein.

Telephone Long Distance 3613 ,or write 331, Fourth avenue, Pittsburg, Pa.

Coal.

PITTSBURG—The coal movement has been better supplied with cars but the central interest of the week was in the beginning of the deliberations on the contract price of fuel and the advance in freight rates. The freight charges will be raised about ten per cent.

CINCINNATI—The coal market has been steady with only a moderate movement, unchanged and quiet. Pittsburg lump afloat is held at 6½c to 7½c per bushel; delivered $3.00 to 3.25 per ton, nut same, and slack $1.75. Kanawha lump, delivered, $3.00 to $3.25; afloat, 6½ to 7 cents per bushel, nut same and slack delivered, $1.65 and $1.75; smokeless lump, delivered, $3.25 to $3.50. Anthracite $7.00.

CHICAGO—Receipts of West Virginia coal are larger, some shippers doubling their business in this direction. Consequently accumulated orders are disappearing rapidly. There is fair prospect that all traces of the late famine will disappear, if the weather continues mild. But the return of sharp temperatures will renew the difficulties. Western coal also is coming forward more freely. Pittsburg and Ohio products do not show corresponding increases, the railroads apparently not yet rising above their recent crippled condition. The trend of values is downward, the most marked changes being those of Illinois and Indiana coals, which have receded below the $2 mark, and cannot be regarded as above normal. Still, demand is quite large and there is no accumulation of any kind of fuel on track.

Coke.

The transportation problem in the coke trade is rapidly being solved. The Pennsylvania railroad has leased 50 heavy engines from the Duluth & Iron Range railroad and turned them into the coke trade. As a result the coke trains are making more headway and the return of empties is much more prompt. The shipments amounted to 254,028 tons last week the largest single week's shipment in the history of the coke trade. The increase was 27,431 tons over the week previous and were nearly 30,000 tons larger than production. At the rate shipments are being made the surplus coke will have been moved from the yards in a month or six weeks and operations increased to such an extent that furnaces will have a fairly good supply of coke in a few weeks.

The Cambria Iron Company abandoned its Morrell plant of 400 ovens last week, reducing number of ovens in the Connellsville region ss than 22,000. The coal field at that plant has all been worked out, and it is expected that these ovens will never be operated again. The year will probably see several hundred other ovens abandoned from this cause.

A summary of the Connellsville region for the week shows 21,605 ovens in blast and 1,120 idle.

The following figures show the scope of operations.

Production for the week	217,843 tons.
" last week	209,224 tons.
Increase	8,519 tons.
Shipments for the week	11,317 cars.
" " last "	10,162 cars.
Increase	1,255 cars.
Shipments in tons for week........	254,028 tons.
" " " last week........	226,104 tons.
Increase	27,924 tons.
Masontown Field	
Shipments for week	527 cars.
" last week................	455 cars.
Increase......................	72 cars.
Shipments in tons..................	13,702 tons.
" last week................	11,830 tons.
Increase	1,872 tons.
Distribution—	
To Pittsburg and river points........	3,343 cars.
To points West of Pittsburg........	5,865 cars.
To points East of Everson............	2,209 cars.
Total	11,417 cars.

Coke Prices.

Pittsburg—Furnace, $2.25@2.50. Foundry, $2.50@2.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.25@4.50 onega, $4.25.

The Metal Markets.

LONDON—Tin—£103 10s-£102. Sales, 720 tons spot; 1,280 tons futures.

Copper—£47 7s 6d-£45 17s 6d. Sales, 1,325 tons spot; 1,300 tons futures.

Lead—£10 8s 9d-£10 7s 6d.

Spelter—£16 12s 6d-£16 6s 6d.

NEW YORK—Tin-$23.12½-$22.60.

Copper—Lake, $12.87½-$11.25; electrolytic, $12.00-$11.50, casting, $12.00-$11.12½.

Lead—$4.02½-$4.00.

Spelter—$4.40-$4.37½.

W. H. Hassinger, general manager of the Republic Iron & Steel Company, Birmingham, Ala., states that the new furnace of that company at Thomas, will not be ready until March owing to the delay in the reception of certain machinery, etc.

Work has been begun under charge of C. W. McCollister, representing the American Tin Plate Company, to dismantle the tinhouse of the old plant of the Johnstown, Pa., plant which was closed down a couple of years ago.

Personal.

Harry W. Armstrong, of Oakmont, who for over 20 years has been superintendent of the Verona Tool Company's mill at Verona, has severed his connection with the active management of the company's affairs. He has been elected to the presidency of the James H. Baker Manufacturing Company, and his office will be in the Park building, Pittsburg. The plant of the company is at Tarentum, and the company is capitalized at $500,000.

A. L. Hammerberg, of Ensley, Ala., has been appointed chief mechanical engineer for the Youngstown Iron, Sheet & Tube Company. Mr. Hammerberg is at present with the Tennessee Coal Iron, & Railroad Company and has been employed by the Morgan Engineering & Construction Company, of Worcester, Mass, and other concerns.

Joseph Rayser, of Youngstown, has been appointed manager of the furnace of the Graham Iron Company, an independent concern of Graham, Va. Until last spring Mr. Rayser was superintendent of the Laura furnace in Haselton. He will take charge of the Graham furnace at once.

E. Webb, formerly with the Jones & Laughlin Company, this city has gone to work as assistant superintendent of the blast furnaces of the Tennessee Coal, Iron & Railroad Company, at Ensley, Ala.

W. A. Barrows, Jr., has been appointed general manager of the three blast furnaces at Sharpsville owned by the Shenango Furnace Company of Pittsburg.

Timely Trade Reminders.

The calendar season brings us many compliments from patrons and friends. Considerable money is being expended in this method of advertising and some of the productions are so expensive that unless a firm puts considerable money into its calendars, it does not pay. Only the larger and more beautiful calendars are retained, the smaller ones being thrown away. The Kier Fire Brick Company, Pittsburg, Pa., has issued two beautiful souvenirs. One a match holder to be hung on the wall with a calendar and strip of sand paper at the bottom, the latter to be used for striking matches. The match holder is composed of Japanese masks and are artistic. The concern has also issued a large calendar illustrating Puffer's picture, "A Child Yawning," which is printed on a rich purple-blue background.

Tranter, Davison & Company, Pittsburg, has issued a map of the United States, Philippine islands, Hawaii, Porto Rica, Guam, Wake islands, Samoa and Alaska. On the maps are printed the dates when the United States acquired the various colonies, and the original colonies which now compose the United States of North America. Illustrations of the various products manufactured by the firm are shown on the margin of the map.

The Globe Rolling Mill Company, Cincinnati, O., has a bright calendar depicting two disciples of Vulcan standing on each side of a globe with a picture of the works depicted in the background. The whole is brightly illuminated and colored.

The S. Obermayer Company, Cincinnati, O., has mailed this office a pad for orders in foundry goods. These were probably mailed to every foundry in the United States and shows the firm is hustling and anxious for business.

The Main Belting Company, through its agency, J. D. McIlwain & Company, Pittsburg, has issued a 1902 greeting. The calendar is adorned with a picture of "Purity."

The Meitz & Weiss gas and kerosene engines are shown in a new catalogue issued by August Meitz, 128-138 Mott street, New York.

The Portsmouth & Kentucky Fire Brick Company, Portsmouth, O. has issued a calendar in black and gold.

The C. W. Hunt Company has issued pamphlet No. .0115 illustrating electric hoists.

Pittsburg Items.

The molders at the foundries of the Zahniser Manufacturing Company and the B. D. Northrup Company, at Washington, Pa., have struck as a result of the refusal of the companies to grant an increase in wages. The men were receiving $2.75 per day and recently they demanded an increase of 25 cents or $3 per day. The works are partially running, apprentices being used to operate them.

The American Steel & Hoop Company, controlling the Isabella furnace plant, Etna, is making improvements at the works. Several changes have also been made in the management, including the resignation of James R. Darragh, who had been employed at the plant since 1871. Two of the furnaces are out of blast, leaving but one in operation.

The employes of the American Steel & Wire Company's mill at Salem, O., quit work last week because of the change in pay ordered by the management. The men claim that the change will reduce wages fully 25 per cent. The mill is non-union.

Notes of the South.

The Gadsden plant of the Southern Car & Foundry Company is at work on 200 cars for the Florida East Coast Railway and has an order for 500 box cars for the Scaboard Air line and one for 500 cars of castingsfor the Pressed Steel Car Company. The soil pipe plant protected at that place is being built.

The grading for the pressed steel car plant of the Southern Car and Foundry Company at Ensley has been completed and the superstructure will soon rise. The grading required several months with one hundred men regularly employed.

The Sloss-Sheffield Steel & Iron Company, is mining 27,000 tons per month of brown ore at Russellville in Franklin county, most of the ore going to its furnaces at Sheffield and Florence. Seven steam shovels and eight dinkey engines are used at this plant.

The city of Sheffield which has gotten to be Alabama's largest pig iron producer after Birmingham, reports for last year the following details of manufacture: 211,809 tons of pig iron, 30,000 tons of rolled iron, 65,000 stoves and 1,500 tons of castings.

The plant of the Semet-Solvay By-product Company, of Syracuse, N. Y.,at Ensley, has been doubled in capacity. Every detail of the work has been completed and the additional 120 ovens will be fired up in the next day or so.

A $100,000 corporation has been organized at Montgomery for the purpose of boring for manganese at that point in South Alabama, which they are keeping secret. It is stated that valuable deposits have been found.

The Bessemer Fire Brick Company is to enlarge its plant at that place, the demand for fire brick being larger than the supply in the Birmingham district, as it has been for some months.

The rail mill of the Tennessee Coal, Iron & Railroad Company, at Ensley, will go into operation at any moment, having been tested and found satisfactory in every appointment.

The Lady Ensley furnace at Sheffield is undergoing repairs. Sheffield citizens are expecting the location there of a slag cement factory, the slag from the Sheffield furnaces being especially adapted for this use.

John C. Brain is endeavoring to enlist the interest of the citizens of Bessemer in the location at that place of a factory for the manufact-of fertilizer out of furnace slag.

The Birmingham Oil & Development Company has struck oil at Bangor in Blount county at a depth of 1,110 feet. Three barrels were obtained.

The Louisville and Nashville Railroad Company is contemplating the second enlargement of its car shops at Decatur, Ala., and the manufacture there of its own axles.

The furnace of the North Alabama Coal, Iron & Railroad Company at Talladega will go into operation this week after extensive repairs.

The Bessemer Land and Improvement Company has bought the coal and ore properties at Scottville, Bibb county.

In the Cincinnati District.

An inquiry was received by the American Tool Works Company the other day from a machine tool buyer who wanted to get estimates on the cost of a lathe the total weight of which would be 8,000 pounds, which he wanted shipped in pieces so that he could transport it by burros over the mountains of one of the South American republics. The Cincinnati concern did not consider the matter as it would have been more than the machine would have been worth to have prepared it for shipment in this way. It is not at all uncommon for machines of light weight to be shipped to be transported by donkey back in parts, but with a large lathe it was considered too expensive and out of the question.

By an arrangement just made with one of the old established and leading concerns in Melbourne, Australia, the Bullock Company is guaranteed a business in electrical machinery from Australasia amounting to not less than $50,000 per year for a period of five years. This important contract, with similar ones covering Japan, the Philippines, and South Africa, about to be closed, will add at least another half million dollars per year to the already large foreign trade of this concern.

Among recent consignments by the Stilwell—Bierce & Smith-Vaile Company to London were two thirty-inch cylinder gates, one twenty-seven inch cylinder gate, and two twenty-seven inch cylinder gate, turbines.

Victor Knecht, proprietor of the Phoenix iron foundry has bought a lot in Fairmount adjoining the Lunkenheimer plant on the C. H. & D., and the C. & W., railways, and will build a new foundry there.

The Holidaysburg Iron & Nail Company has announced that it will build an addition to its ant 100x200feet which will double its capacity.

A white lead works, which will employ 400 hands, is to be established at Chester, Pa.

Industrial Notes.

With a capital stock of $50,000 the Davis, Walker & Cooper Company, Youngstown, O., will proceed at once with the building of a machine shop and steel forging plant. The incorporators of the new company are James Cooper, Charles Walker, Evan J., Frank B. and Harry L. Davis. By the terms of a deal closed lately the company came into possession of the Walker Engineering Works; Youngstown. It is the intention at once to proceed with the building of a large new plant for manufacturing machinery and forging steel.

The Central Iron & Coal Company has acquired the properties of the Martin Mining Company and the Woodstock Ore Company Tuskaloosa county, Ala., embracing 1,000 acres. The ore mines purchased have an output of 4,000 tons per day and there are ore washers and other machinery on the acreage. The Edwards furnace near Woodstock, a long idle plant, has also been bought by the Central company. The company is now at work grading preparatory to the erection of a furnace.

The Croton Brick & Limestone Company, New Castle, Pa., has been organized. The stockholders are: Alexis W. Thompson, Mrs. Joseph Pearson, S. D. Pearson, C. W. Rhodes, and J. C. McCready. Besides operating the old Pearson quarry the new concern will build a brick plant with a capacity of 30,000 bricks per day. Ground for the works has been broken.

A meeting of the Ohio Galvanizing & Manufacturing Company, Niles, O., was held a few days ago at which the following officers and directors were elected: F. F. Bentley, president; A. J. Bentley, secretary and treasurer; W. H. Smiley, vice president; F. F. Bentley, A. J. Bentley, W. H. Smiley, J. S. Caldwell and A. S. Leitch, directors.

The Alabama negroes imported to Sydney Nova Scotia, by the Dominion Coal & Iron Company, have been put to work on the coke ovens there. They have been assigned separate quarters. Their importation is said to have been due to the indisposition of the native white labor to endure the heat of the coke ovens.

The rail mill of the Tennessee Coal, Iron & Railroad Company, at Ensley, Ala., has been tested and found satisfactory. The plant will be put into operation with a few hours' notice as soon as the Tennessee Company decides that it should start.

At the annual meeting of A. J. Haws & Sons, limited, Johnstown, Pa., held a few days since. the old officers were re-lected as follows: President, W. H. Haws; secretary, Herbert H. Morris; treasurer and general manager, James P. Thomas.

A new manufacturing plant will be built soon on Lake street between Coe street and Marquette street, Cleveland, O., by the Chicago-Cleveland Car Roofing Company. The building will be 700 feet wide and 325 feet long, and will be one story high. It will cost about $25,000.

The Grafton Pump Works, located at West Grafton, W. Va., has been bought by O. G. Augir, builder and contractor, of Grafton. The new management will at once put in new machinery and place the plant in first class condition.

A knitting factory is to be established at Bradford, Pa., by Joseph T. Stead and others who will commence the erection of suitable buildings at an early date.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including January 13, 1901:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUN
Transit	265,188	171,397
Tidewater	97,982	38,578
Southwest	28,877	102,883
Eureka	13,582	397,201
Buckeye, Macksburg oil	78,859	150,874
New York Transit	287,358	
Southern	250,963	....
Crescent	50,637	....
Total	1,068,796	866,466
Daily averages	89,092	72,206

LIMA.

Buckeye / Indiana Local Division	618,883	583,770
Daily average	61,574	49,064

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
January 8	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
January 9	1.30	1.15	1.15	0.83	0.80	0.80
January 10	1.30	1.15	1.15	0.83	0.80	0.80
January 11	1.30	1.15	1.15	0.83	0.80	0.80
January 13	1.30	1.15	1.15	0.83	0.80	0.80
January 14	1.30	1.15	1.15	0.83	0.80	0.80

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots; lots of 100 pounds, $1.10 per lb.: special price on large lots.

Developing Coal Land.

Arrangements were made January 9 by Thomas Lynch, president of the H. C. Frick Coke Company and general manager of the coke and coal interests of the United States Steel Corporation, for the development at once of a 20,000-acre tract of Pocahontas coal in the Elkhorn and Tug river valleys, West Virginia, at a cost of $3,000,000. Three corps of surveyors are now in the field, a branch line of the Norfolk & Western to the tract is to be built, a number of mines opened and 3,000 coke ovens built. Work will be started this spring, about $1,500,000 will be expended this year and it is expected that coke will be made before next Christmas to supply the Western plants of the combine.

An arrangement has been made with the Norfolk & Western railroad for the construction of a branch from the main line at Welch up the Tug river six miles to the location of the first mining operation.

It is the intention this year to build 1,200 bee-hive ovens. The valleys are so narrow and gorge like that it is difficult to find sufficient bottom land for the tipples and ovens. The purpose is next year to build the remainder of the 3,000 ovens planned. About 1,500,000 tons of coke will be made and about 1,000,000 tons of coal in addition will be mined and shipped West over the Norfolk & Western. The nature of the coal is such that it will probably have to be crushed in order to fuse it properly and make the best possible blast furnace coke.

It is the intention of the corporation to develop the 20,000 acres at once. The United States Coal & Coke Company will be organized to operate the property under a similar plan in effect with respect to the other coal and coke operations of the steel company. The Frick company will dispose of the product. Charters will be secured either in New Jersey or West Virginia. William G. Wilkins, the well-known Pittsburg mining engineer, has been selected to take active charge of the operations for the development of the property.

Telephone Course at Purdue.

Purdue University, LaFayette, Ind., will inaugurate, about February 1, 1902, a new department of instruction in telephonic engineering. This step is taken in response to the increasing demand by telephone interests for men trained in the particular branch of electrical engineering pertaining to telephony.

Investigation has disclosed the fact that students completing the ordinary courses in electrical engineering must devote upwards of two years' additional work to acquire in the special details of telephone practice before they are sufficiently equipped with the knowledge which is valuable to manufacturers and consumers of telephone material. It is confidently expected that the courses now offered by Purdue University will largely take the place of the two years' practical employment or appenticeship and will enable the engineering graduate of this department to at once fill telephonic positions demanding special qualifications.

The proposed course in telephonic engineering will be based upon the general course of electrical engineering already provided for by the curriculum and extensive laboratory equipment of the university. It will include practically all of the required work of the present course in electrical engineering through the junior year, in English, mathematics, shop practice, drawing, German, physics, chemistry, history, descriptive geometry, physical and electrical measurements, mechanics, engineering design, etc.

The wages of 10,000 Alabama coal miners have been raised to the maximum of 55 cents per ton, it having been ascertained that the average price of pig iron obtained by the producers during December was over $11 per ton. The maximum wage has not been enjoyed for twelve months. Wages are governed by the price of pig iron.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 10
Galvanized, car lots, jobbers	2 55
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 60
Wire, plain, car lots, retailers	2 10
Galvanized, car lots, retailers	2 50
Wire, plain, less than car lots, retailers	2 42
Galvanized, less than car lots, retailers	2 66
Wire nails, car lots, jobbers	2 20
Wire nails, less than car lots, jobbers	2 51
Wire nails, car lots, retailers	2 10
Wire nails, less than car lots, retailers	2 21
Cut nails, car lots	1 80
Cut nails, less than car lots, jobbers	1 80
Cut nails, car lots, retailers	1 95

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut		9½ c
Copper, light bottoms		8 c
Heavy Composition	9½ to 10 c	
Brass Turnings	6½ to 7 9	
Heavy Brass	7.25	
Light Brass	5.00	
Heavy Lead	3.75	
Tea Lead	3.50	
Zinc Scrap		$3.00
No. 1 Pewter	16	

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 50
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight, 14x20; $4 10 for 100 lbs.; $4 05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4.75.

Steel Corporation Earnings.

The following is the statement of the steel corporation made public by Chairman E. H. Gary after the meeting, January 7, at New York:

Net earnings of all companies from operations for nine months ending December 31, 1901, viz:

April	$7,356,844	October	$12,205,774
May	9,612,349	November	9,795.841
June	9,394,747	December (est)	7,750,000
July	9,580,151		
August	9,810,880	Total	$84,779,298
September	9,272,812.		

Less amounts set aside for the following purposes, viz: Sinking funds on United States Steel Corporation bonds, and bonds of subsidiary companies, $2,263,292; depreciation, reserve and contingent funds and improvements, $9,695,702; total $11,958,994; balance, $72,820,304; nine months' interest on bonds, $11,400,000; balance, $61,420,304. Nine months' dividends on stocks, viz:

United States Steel Corporation:	
Preferred $5\frac{1}{4}$ per cent (7 per cent annually)	$26,752,894
Common, 3 per cent (4 per cent annually)	15,227,812
Total	$41,890,706
Outstanding stocks of subsidiary companies	25,101
Total	$42,005,807
Balance applicable to surplus or new construction	$19,414,497

E. Shearson, Comptroller.

During the close of lake navigation, from December to April, inclusive, the earnings of mining and transportation companies are, of course, diminished.

The preferred dividend is payable February 15. Books close January 25 and re-open February 18. The common dividend is payable March 21. Books close February 27 and re-open March 22. The books will close for the annual meeting January 25 and re-open February 18.

The sinking fund on United States Steel Corporation bonds and the bonds of subsidiary companies consumed $2,263,292, and depreciation, reserve and contingent funds and improvements $9,695,702. The sum of $11,400,000 was paid in interest on bonds for nine months, and $42,005,-807 was paid out in dividends. The balance available for surplus for new construction amounted to $19,414,497.

The above figures show that since its formation the corporation has earned over $300,000 a day for the stockholders. From the orders on hand for the next three months it is expected that the fourth quarter will show earnings equal to those of the third quarter, so that the entire year's earnings of the company will be close to $110,000,000. It has been figured out that it takes about $72,000,000 to pay the dividends on both the common and preferred stocks at the present rate and to pay interest on the bonds, so that in the first year of the company's existence it will earn a surplus of about $38,-000,000.

Technical Bodies.

The twenty-third annual meeting of the Engineers' Club of Philadeplhia will be held Saturday, January 18. Carl Hering will present the following proposition for consideration and adoption by the club: "In view of the fact that bills for the adoption of the metric system of weights and measures by the United States are to be considered during the present session of Congress, the Engineers' Club of Phialdelphia hereby expresses its endorsement of the adoption of the system." Henry Leffmann will read an address on "Ancient Metallurgy." At the last meeting, Dr. S. W. Stratton, Director of the Bureau of Standards, presented the paper of the evening on the relation of the National Bureau of Standards to Engineering and Manufacturing Interests." He gave an historical account of the standards of measurement which have been used by this government, pointing out the fact that for graduating length measures the metric standards were more accurate than the standards of feet and yards. He explained the purpose of the bureau to prepare for general distribution certified duplicates of standard measures, and pointed out the importance to engineering and manufacturing business of uniformity in these matters.

The subject was discussed by Messrs. James Christie, Jesse Pawlin, Jr., Carl Hering, Henry G. Morris, Henry Leffmann, George M. Sinclair, William C. L. Eglin, A. B. Eddowes, P. J. A. Maignen, and others.

The United States Aluminum Castings Company, launched a year ago by Emerson Davis, and Edward A. Sawer, with several meritorious inventions and processes has achieved gratifying success. The specialty is the aluminum casting, Acme aluminum, which is more than three times lighter than brass. It is adapted for innumerable purposes, such as certain parts of machinery, gear cases, crank boxes, etc. It retains the original color of pure aluminum, and has a lasting finish, as brilliant as nickel plate. The firm was recently incorporated, and is now making changes which will give it additional space, and facilities for increasing its capacity to the growing requirements of the business. The officers are Edward A. Sawer, president; C. F. Root, treasurer; Emerson Davis, general manager.

Patents.

The following patents granted January 7,1 902. are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park Building, Pittsburg, Pa., from whom printed copies may be procuced for 15 cents each:

Steam separator, D. E. Austin, Detroit, Mich.; steam boiler, G. E. Hesse, Brooklyn, N. Y.; furnace for burning bituminous coal, E. M. Hugentobler, New York, (2); speed regulator for explosive engines, A. L. Kull, Camden, N. J.; automatic boiler feeder, Frederick Leadbeater, Detroit; boiler furnace fire arch, J. P. Sneddon, Barberton, O., assignor to the Stirling Company, Chicago; boiler tube cleaner, Max Snyder, Beatty, Pa.; explosive engine, F. D. Sweet, Elyria, O.; apparatus for the vaporization, combustion and utilization of hydrocarbon oils, Thomas Tomlinson, Bray, Ireland; internal combustion oil engine, H. F. Wallman, Chicago, assignor to the Wallman Engine Company, same place; steam pumping engine, C. C. Worthington, Irvington, N. J.; drainage system for steam plants, John Angell, St. Louis; smoke consuming furnaces, G. S. & J. J. Huff, Indianapolis (2); mechanical stoker, same; automatic clutch, same; hydrocarbon engine, A. D. Richardson, Beloit, Wis.; telescopic compound engine, William Schneider, Chicago, assignor to the Whitfield Company, Memphis, Tenn.; ignition plug, I. H. Davis, Boston, and E. D. Mellon, Cambridge, Mass.; trap, R. G. McAuley, Pittsburg; smoke consuming device, J. H. Strehli, Cincinnati; process of manufacturing mineral wax from bituminous brown coal, Edgar von Boyne, Hamburg, Germany; steam boiler, C. J. Cronin, Youngstown, O,; steam boiler, B. F. Jackson, North Cambridge, Mass.; coke oven, R. D. Martin. Alderson, Ind. Ter.; tubular boiler, W. B. McCord, Battle Creek, Mich.; apparatus for cooling and cleansing blast furnace gases, B. H. Thwaite, Westminster, England, assignor to the Blast Furnace Power Syndicate, London; hydraulic motor or pump and reversing valve therefor, W. O. Worth, Chicago; boiler setting, G. L. Norman, Atlanta, Ga.

B. & O. Rail Consumption.

During the last year the Baltimore & Ohio Railroad Company purchased 40,651 tons of steel rails and during the past six years 330,234 tons have been purchased. These figures have been issued by the officials of the company. When the railroad went into the hands of the receiver, in March, 1896, there was little rail in the tracks heavier than 70 pounds to the yard. All of the light rail has been removed from the main line of the road and put in side-tracks and on the smaller branch lines, where there is but little traffic, and has been replaced by rails weighing 85 to 100 pounds per yard.

For the past six years the number of tons of rails purchased by the company is as follows: 1896, 22,098 tons; 1897, 31,547 tons; 1898, 35,197 tons; 1899, 75, 618 tons; 1900, 71,955 tons, and 1901, 40,651 tons.

Aside from the necessary expenditures to keep the road in operation the company has been spending on an average of $15,000,000 per year for the past six years. New bridges have been built and old bridges strengthened to carry the increased weight of the new equipment which has been bought; grades have been reduced and curves eliminated where possible; single track has been supplanted by double track; the main line of the road has been re-ballasted from end to end, and new wharves, storage houses and grain elevators have been constructed to take care of the constantly growing traffic. On the Pittsburg division alone $1,438,856 was expended in betterments last year and as much, if not more, is to be spent this year; Since 1896 the mileage, exclusive of yard tracks, sidings, second tracks has been increased from 2,096 to 4,357 miles.

The Coal Company Changes.

At the annual meeting of the stockholders of the Pittsburg Coal Company, F. L. Robbins, chairman of the board of directors and of the executive committee, was elected president, the three offices being consolidated. John D. Nicholson, vice president, was elected treasurer, the two offices being combined. Henry C. Frick was elected director to fill a vacancy. J. B. L. Hornberger was elected auditor, a promotion from his former position as assistant auditor. F. J. LeMoyne was elected secretary. The regular quarterly dividend of 1¾ per cent on the preferred stock was declared. A lease of the property of the Shaw Coal Company covering a period of 40 years was proved.

The company has acquired or holds under options coal properties in the Hocking Valley of Ohio worth approximately $1,000,000. The Columbus and Hocking Coal & Iron Company, capitalized at $7,000,000, is not included. The properties that have been or are to be taken over are already established as dividend earners.

The purpose of the purchase, aside from the ordinary business importance of the venture, is to supply a market in the Northwest, which the Pittsburg Coal Company now has for its own through the acquisition of important docks along the upper lakes and which have been closely associated with the Hocking Valley coal interests.

Present Tendencies of Lake Ship Building.

BY WALDON FAWCETT.

THE foundation principle of ship building on the great lakes as regards the size of the steel cargo carrying vessels for service on the inland seas appears to have undergone a virtual revolution within the past two or three years. Previous to that time the very manifest tendency was to follow in the footsteps of the ship builders whose efforts are directed toward a continual increase in the size of the passenger steamers engaged in the Transatlantic trade; and in consequence the closing year of the century was the entrance into service on fresh water of four steel steamers each approximately five hundred feet in length while some of the more fanciful shipping men were ready to predict the era of the six hundred or even seven hundred foot lake vessel. With the advent of the new century, however, there was

manifest a revulsion of tendencies and how marked in his disposition to return to the normal in the size of craft is demonstrated by the fact that of the thirty-one new vessels which will go into service for the first time on the great lakes in the spring and early summer of 1902 none are over 436 feet in length and only half a dozen exceed 400 feet length.

On the great lakes as on the ocean the increase in the size of the vessels was a gradual evolution. In the ten years from 1890 to 1900 the standard type of freight carrying steamer increased from approximately 300 feet in length to a length of 500 feet while the dead weight carrying capacity was extended from 2,500 to 7,000 gross

tons. In other words the steel steamer Matoa which at the opening of the final decade of the century was the largest freighter in service was 290 feet in length, 40 feet, beam and 21 feet depth where as the steamer John W. Gates the vessel which upon her completion in 1900 marked the maximum size of lake cargo carriers is 498 feet in length, 52 feet beam and 30 feet molded depth.

Vessel owners who made an exhaustive investigation were ready to declare that the progress in facilities for loading and unloading cargoes had not been proportionate to the advancement in the size and capacity of vessels but the sudden discontinance of the policy of gradual hull enlargement and the ultimate return to the normal size of carriers, which are now called for, was due almost solely to navigation conditions and the exigencies of the harbors at lake ports. It was found that whereas, to all intents and purposes, the lengthening of the lake vessel might continue indefinitely, the narrow rivers which the vessels are obliged to enter at many of the principal ports would not enable a proportionate increase in beam: whereas the depth of the channels at many points on the chain of lakes precludes the possibility of adding to the depth of a vessel. The five hundred foot ship was planned in the day when a channel twenty feet in depth throughout the entire length of the lakes was regarded as a certainty of the immediate future. When the lake ship builders realized not only that they could not rely on more than eighteen feet depth of water under most favorable conditions and that to secure and maintain the desired uniform depth of twenty feet could entail a greater governmental expenditure than they could hope to secure, there was inaugurated the policy which is just now bearing fruit in the advent of a class of freighters of decreased size.

The largest of what might be termed these new classes of lake ships are 436 feet in length over all, 50 feet beam, and 28 feet depth. A steamer of this size has on a draught of eighteen feet a carrying capacity of approximately 6,200 gross tons and costs complete $260,000. If in this new era any one class of freighters can be said to be of standard size the designation should undoubtedly apply to the 400 feet freighters which are of the same beam and depth as the above mentioned vessel and while providing a carrying capacity of 5,600 tons entail an outlay of $20,000 less in the cost of each vessel. There are also being constructed on the great lakes quite a number of vessels which range from 366 to 390 feet in length but have a uniform beam of 48 feet and a uniform depth of 28 feet. The capacity of these steamers range from 4,800 to 5,200 tons each and their value is in the neighborhood of $220,000 to $230,000 according to the varying size.

A circumstance which indicates a partial change of policy in lake navigation and ship building interests is found in the fact that of the thirty odd vessels which will go into commission on fresh water for the first time in the interval between January 1 and July 1, 1902, but a single one is a tow barge. In many previous years the number of barges under construction has equalled if not exceeded the steamers designed for freight carrying, and the curtailment of building operations in this line is taken to indicate a disposition, to, in some degree, abandon the policy so long in vogue on the great lakes of having a steamer tow one or possibly two barges, each of equal or greater dimensions than the towing steamer. The possibilities of this plan, like the magnitude of lake ships, reached a climax in the closing year of the century, when on occasions vessels conducted two consorts, and thus a single engine moved upward of 19,000 tons of iron ore throughout almost the entire length of the great lakes a an average speed in excess of thirteen miles an hour. It may be noted in passing that the recent revolution also appears to have retired the quadruple expansion type of engine as a propulsive power on the inland seas, for all of the new vessels without exception are fitted up with triple expansion engines. The use of Sctoch boilers is also almost universal.

The shipping and ship building interests on the great lakes manifest no inclination to depart from the tried policy of constructing side-wheel steamers for passenger service, and indeed there are now under construetion the two largest side-wheel steamers ever built at fresh water vessel building plants. Some years since there were constructed at Cleveland two very large and magnificent steel passenger

steamers of the ordinary propeller type and these vessels have since that time been regularly in service but they have made no such demonstration of superiority as to nduce the general adoption of the innovation.

The new side-wheel steamers, designed to make the run of 256 miles from Detroit to Buffalo in twelve hours under almost any weather conditions, are each 366 feet in length, 55 feet beam and 19½ feet in depth. Each ship has inclined three cylinder compound engines with eight boilers and the completed steamer represents an investment of nearly $650,000. An interesting demonstration of the utilities of the typical side-wheel steamer in lake service was made during the summer of 1901 when in a test of speed the steamer City of Erie defeated the Tashmoo, another side-wheeler by the narrow margin of 45 seconds in a run of one hundred miles. As affording an enteresting comparison it may be noted that while both vessels are of the same lingth the Erie has a displacement of 2000, as against 1200, tons in the case of the

Tashmoo. Counter-balancing this advantage the winner had engines of 6,000 horse-power as compared with propelling machinery of 2,800 horse power possessed by her rival.

From a general standpoint perhaps the most interesting of present tendencies in lake ship building is found in the inclination of the powerful steel vessel-building interests of the interior to enter upon the construction of large-size steamers for ocean service. For many years past occasional vessels have been transferred from the great lakes to the Atlantic coast but very few of them had been constructed designedly for salt water service. Lately the ship-building institutions have entered upon the construction of craft for salt water service as a regular branch of their operations, and the progress which has been made is evidenced by the fact that during the opening

year of the new century lake ship builders secured contracts for the construction of thirteen steel steamers suitable for ocean service.

The few vessels constructed on the lakes, prior to 1901, for service on salt water had invariably been of such dimensions to permit of their passage through the canal of the St. Lawrence, that is ships not exceeding 270 feet in length—but henceforth the construction of ships of much greater magnitude will be undertaken. Indeed the spring of 1901 witnesses the transportation to the Atlantic coast in sections of two steel steamers each 450 feet in length, 43 feet beam and 35 feet depth with a carrying capacity of 7,000 tons.

The method to be followed in the transfer of the large steamers built for salt water service will doubtless vary in different cases in the usual way and the hull fully completed save for a space of about two plates in or near the center. These plates during the time the hull was on the stocks are simply bolted. A bulkhead is constructed on either side of the spaces and when the hull is fully completed in other respects, the plates are removed, stored in one end of the ship and the hull launched in two pieces. The hull is sufficiently completed on the stocks to admit of measurement. Each section may be towed through the canals by a tug or that part of the hull containing the machinery can tow the other portion. At Montreal the two sections are joined together and continue to the sea coast. Such is the magnitude of the plans made that it is proposed to establish a ship yard at Montreal the main purpose of which will be to connect the portions of vessels which, by reason of their size, have passed through the canals in sections.

Securing Metallic Lead From Its Ores.

ANTONIN GERMOT, of Asnieres, France, has obtained a patent on a process for obtaining metallic lead from its ores. Use is made of a crucible or converter the top of which is furnishd with a reduction-pipe leading to a collecting-chamber or to several such chambers, the top of the crucible around the ortice of the eduction pipe being hermetically closed, so as to prevent any entry of air.

At starting a first mass of galena is melted in the crucible, and through the melted mass a current of air is blown either through the bottom or the side of the crucible or by means of a vertical blast-nozzle entering the molten mass. The galena rapidly becomes liquified, and the injected air burns part of its sulfur, producing sulfurous acid and lead, according to the formula $PbSx2O=PbxSO_2$.

The combustion of the air injected raises the temperature, which is maintained by the continuous addition of fresh quantities of ore. The lead separates from the sulphurous portion, the latter occupying the upper part and the former accumulating in the lower part of the crucible in a mass containing the whole of the silver in the ore. The sulphurous acid escapes from the upper portion carrying off without contact of external air a quantity of sulphide of lead free from silver, which passes by the eduction pipe into the collectors, where it condenses in the form of a black, heavy, and very fine powder, which is easily collected, even during the course of the operation, for re-introduction into the same crucible or for introduction into a similar and separate crucible. Where the ore treated contains no silver, the eduction pipe may be carried vertically upward to a sufficient height for the sulphide powder to fall back into the molten mass in the crucible.

Where the ore treated contains other metals besides lead—such, for instance, as silver—the distilled and condensed galena contains no silver, the whole of that metal remaining in the lead. If, therefore, the condensed galena be further separately treated in the same way as the orginal galena, a very pure lead will be obtained.

SHOCKS IN PILE DRIVING.

BY D B. DIXON.

IN excavating for the foundations of our modern steel sky scrapers—so called—and other structures having great weight, and which are intended to support still greater weight, if the clay is found to be of a loose nature, or wet, or if quicksand is struck, resort is had to wooden piles in order to secure a permanent and safe sub-foundation. In view of this fact, the object of this article is to show how to obtain the best results in pile driving and similar operations. A falling body cannot do more work when its progress is arrested than has been done on it in lifting it up to the height from which it has fallen. Thus, for example, let us suppose that the monkey of a pile drvier weighs one ton, and that it falls four feet onto the head of a pile; then the work in the monkey cannot be either more or less than equivalent to four foot tons. A foot ton is simply an arbitrary unit. The proposition may be expressed in various ways. Thus, the work in the monkey at the moment it touched the head of the pile would be sufficient to raise the monkey up again to the point from which it fell; or to raise a weight of four tons a height of one foot; or to raise one pound through a height of 2,000 x 4=8,000 feet, or to raise a weight of 48 tons through a height of one inch, and so on. It is essential that this little matter of equivalence be clearly understood. To drive it home still further we may say that a horse-power is equivalent to lifting a weight of 33,000 pounds through a height of one foot in one minute. But the result would be the same if one pound was raised 33,000 feet in one minute. We may, in short, go on ringing the changes how we please between weight and height. The result will invariably be the same, one element in the calculation being always diminished as the other is increased. Now, it is clear that if our monkey were employed to raise one ton through a height of four feet it must exert a force or push of one ton throughout the distance of four feet. If it did not, it would not move one ton at all, for it would be overbalanced. If it were called upon to raise four tons through a height of one foot, then it must exert a push of four tons through a distance of one foot; if to lift a weight of 48 tons, then it must exert a push of 48 tons through a distance of one inch, and so on.

Bearing this in mind, there will be no difficulty in understanding the following simple rule: The force of a blow is measured by dividing the whole distance x passed through by the monkey before impact by the distance passed through after impact, and multiplying the weight by the quotient. Thus, let the monkey weigh one ton, let the fall x be 48 inches, let the pile descend one inch equals y at each blow, then the force of the blow—or, in other words the push or effort exerted by the monkey on top of the pile—will be 48 divided by 1=48, and 48 x 1 equals 48 tons. If the fall was 20 feet or 240 inches, then the effort would be 240 tons, and so on. It must be understood that this is the mean or average force of the blow. Its initial effort may be much greater, and its terminal effort may be much less, because at the instant of impact the monkey is moving at its full velocity, while at the moment when the pile ceases to descend it will have no motion at all, and consequently will exert no push, except that due to its weight. With this aspect of the question, however, the student need not now concern himself.

It will be seen that the force can be varied by altering either the distance passed through before or after impact. For example, the monkey weighing one ton and falling 48 inches, let the pile descend only ⅛ inch, then 48 x 8 equals 384 tons; and this leads to an important reduction. If y becomes infinitely small, the force of impact will become infinitely great. We are led thus to the ancient problem, if an irresistible force encounters an insurmountable obstacle, what will happen? No such condition can by any possibility occur in practice. Some movement must take place after impact. Three factors are in all cases necessary, namely, the weight, the height of fall, and the distance through which the body which receives the blow moves. In practice it is by no means easy to ascertain the latter with precision; and the energy in the falling body can be expended in more ways than one. For ex-

ample, when the head of a pile is struck two effects take place simultaneously—the monkey is shortened and so is the pile. The elastic rebound of each immediately takes place, and the monkey jumps up from the top of the pile. Again, the top of the pile becomes highly heated. In very dry weather the top of a pile has been known to take fire under the blows of a light monkey rapidly repeated. The elasticity of the pile plays an important part in influencing the rate of its descent. A monkey weighing 100 pounds, falling a height of 50 feet, will have stored in it on impact 100x50=5,000 foot pounds, and if the progress of the pile were one inch, its driving force would be 600x100 equals 60,000 pounds. A monkey weighing 1,000 pounds, and falling 5 feet, would also have 5,000 foot pounds of work in it, and would exert a driving force of 60,000 pounds over a space of one inch; but it does not follow that the former would be equally effective in driving the pile. On the contrary, the lighter monkey striking the pile with a higher velocity might be much the less efficient of the two, because the force of the blow would not be transmitted through the pile, but would be expended in compressing the top of it, probably in shattering the wood. When a pile is struck on the top, what is known as a wave of compression passes through it; and this wave requires time for its passage. Such a wave is set up in all columns when stress is suddenly brought on one end. Thus, for example, if the muzzle of a shotgun containing a column of air is plugged up with a cork; or with snow or mud, the barrel may be burst when the weapon is fired, simply because, while the pressure at the muzzle is yet too small to move the cork, the pressure at the breech end is great enough to burst the barrel. The wave of compression will not reach the muzzle till the breech has been burst. In the same way the detonation of a stick of dynamite on a rail will break it, the action being so sudden that the wave of transmission of pressure has not time to pass through the air surrounding the dynamite, and the air really plays almost the same part as a block of steel round the explosive.

The effect of a heavy ram falling a short distance on a pile head resembles a push, in a sense, and gives time for the transmission of the effort throughout the whole pile, but when a light monkey falls the effect may be confined to the top of the pile, which is shattered. In order to make this quite clear, we must take into account the element time, concerning which we have said nothing yet. The velocity with which a monkey strikes a ram is calculated by extracting the square root of the height of fall in feet and multiplying it by eight. Thus, let the monkey fall four feet; the square root of 4 is 2, and 2 x 8 equals 16 feet per second. If the monkey falls, as stated in our last example, 50 feet, then we have 7 as the nearest whole number square root, and 7 x 8 equals 56 feet per second as the velocity with which the monkey would strike the pile. If this speed was greater than that at which the wave of transmission could pass through the pile, then little or no effect would be produced in the way of causing its descent; nearly the whole of the work would be done in compressing the top of the pile or in shattering it, and the driving effect would be nothing. The effect of the element time is not sufficiently well understood. About, indeed, the only thing fully recognized is that a heavy monkey falling from a moderate height is, other things being equal, much more efficient than a light monkey falling from a great height.

New Metal Car Patented.

A NOVEL idea in metal cars has been patented by Lewis T. Canfield, of Scranton, Pa., who has sold his entire interest to the Sterlingworth Railway Supply Company, of Easton, Pa.

His idea is to construct the walls of freight cars of channel beams, the flanges of which rest upon each other and are rivited together, the bottom flanges being rivited to the under frame of the car. The flanges at the ends are mitred, and the channel bars constituting the end of the car are carried across the width of the body and cut off rectangular at their ends. The side bars are provided at their ends with wings that are bent over so as to rest against the outer surface of the web parts of the end bars, and these wings are then riveted to the webs. In this manner a strong corner joint is provided.

HISTORICAL SKETCH OF THE FOUNDATION OF THE METRIC SYSTEM.

BY S. BASSOTT. (Continued.) *

The report, instructions and vocabulary served as a basis for a decree which was adopted by the Convention and promulgated on 18 Germinal (seventh month) year III. It fixed definitely the different parts of the metric system which should have no change; it is consequently interesting to reproduce the principal provisions:

Art. 1. The time prescribed by the decree of August 1, 1793 (old style) for the usage of the new weights and measures is past as to the obligatory provision concerning which the National Convention passed a new statute by reason of the progress of their construction; the citizens are therefore invited to give a proof of their attachment to the unity and indivisibility of the Republic in now using the new measures in their calculations and commerical transactions.

Art. 2. There will be only one standard of weights and measures for all the Republic: this will be a rule of platinum upon which will be traced the meter which has been adopted as the fundamental unit of the system of measures. This standard will be constructed with the greatest care according to the experience and observations of the commissioners charged with its determinaton and will be deposited with the legislative corps at the same time with the process of the operations which served to determine it so that it may be verified at all times.

Art. 3. There will be sent to each principal city of a district a model conformed to the prototype standard which has just been mentioned and beside a model of weights accurately deduced by the system of new measures.

Art. 4 The extreme precision which will be given a standard of platinum not being able to influence the exactness of measures in common use, these measures will continue to be made after the meter adopted by the former decrees.

Art. 5. The new measures will be distinguished in the future by the name of measures of the Republic, their nomenclature being definitely adopted as follows:

Metre—The measure of length equal to one ten-millionth part of the arc of a terrestrial meridian between the North pole and the equator.

Gramme—Absolute weight of a volume of pure water equal to a cube of one one-hundredth part of a meter at the temperature of melting ice.

Finally the unit of coined metal shall take the name of franc to replace the livre used until to-day.

Art.6. (Definitions of the subdivisions and multiples of the units of measure, of capacity, of weight, etc., and of coins.)

Art. 8. In the weights and measures of capacity, each of the decimal measures shall have its double and half.

Art. 10. The work relative to the determination of units of measure of length and of weight deduced from the size of the earth, begun by the Academy of Sciences and continued by the temporary commission of measures, in consequence of the decrees of May 8, 1790, and August 1, 1791, shall be continued until entirely finished by the special commissioners chosen principally among the scientific men who have concurred in these operations until now, the list of which will be selected by the Committee of Public Construction. By means of these provision the administration of the committee called the Temporary commission of weights and measures will be set aside.

Art. 12. The provision of the law of the 4 Frimaire, year II., which rendered obligatory the use of the decimal division of the day and its parts, is indefinitely suspended.

Art. 15. As soon as the standard prototype of the measures of the Republic shall be placed with the legislative corps by the commission charged with its construction, it will rear a monument to preserve it and guarantee it against the injuries of time.

* Translated by Miss F. E. Harpham, Chief Computor in the Astronomical Department of Columbia University

Conforming to the provisions of Article 10, the Committee of Public Instruction named the following twelve Commissioners: Berthollet, Borda, Brisson, Coulomb, Delambre, Hauy, Lagrange, Laplace, Mechain, Monge, Prony, Vandermonde. These commissioners met on 21 Floreal (eighth month) and divided the work thus: Delambre and Mechain to have charge of the geodetic and astronomical operations. Borda, Hauy and Prony of the determination of the units of weight. Borda and Brisson of the construction and verification of the provisional metre. Berthollet, Monge and Vandermonde of the construction of the definitive meter. The length of the pendulum had already been measured by Cassini and Borda in June and July, 1792.

Borda and Brisson presented on 18 Messidor (tenth month) their report upon the verification of the meter. They had taken for the bases of their work the old measures of a meridian of France made by Lacaille and according to which the meter should be equal to 0.513243, about 3 feet 11.44 l. The toise in question is that known under the name of the toise of the Academy and which served for the measure of the bases of the terrestrial arc in Peru and for the basis of the meridian in France. The commissioners decided that the standard should be brass and that, supposing the temperature to be 10 degrees., it should contain three feet 11.44 l of the iron toise of the Academy, supposing the thermometer to be 13 degrees R. (the temperature at which the bases of the arc of the meridian were measured). They used for comparison a rule of brass constructed by Lenoir, with which they determined with much precision the small difference between two measure almost equal between them. They worked with four different meters and adopted as a provisional standard meter number II., which was found to have sensibly the required length.

Delambre and Mechain who had set themselves at the work in 1792 were not able to finish it before the year VII., at the cost of indescribable trials and fatigues. They used for the determination of the angles repeating circles invented by Borda and constructed by Lenoir, and for which he had adopted the decimal divisions. The bases were measured by means of four rules of platinum constructed also under the direction of Borda, the length of which had been compared with that of the toise of the Academy.

This work began on June 25, 1792. Mechain in charge of the portion comprised between Rodez and Barcelona was arrested at Essonne, at the very gates of Paris. He was very near putting off the work and delaying the operations until a more tranquil time in consequence of the agitation in the minds of those who wished to see in the astronomical instruments which followed him only instruments of a counter revolution. He, however, was able to reach the frontier of Spain and immediately setting himself to work, he reconnoitered the summits of the triangles between Barcelona and Perpignan. The measurement of the angles began in September, 1792, and was finished in November, with the exception of two frontier stations. Mechain devoted the winter to astronomcial observations, especially to the determination of the latitude of the Southern terminal of the meridian at Mt. Jouy. At the moment when spring permitted him to resume the course of his work, he was the victim at Barcelona of a terrible accident in which he had several ribs and his collar bone broken, and which condemned him to two months of inactivity. And when he wished to make the stations of the Pyrenees the captain-general of Catalona refused him the necessary passports and signified to him that he could leave Spain only after peace. It was at this same moment that a decree of the committee of Public Safety removed six members of the commission of measure. One would have thought, as Delambre remarked, that the two governments, divided upon all points united to hinder this work.

Forced to return to Barcelona, Mechain took advantage of this to verify his observations of the preceding winter; and it was then that he conceived the project of binding the island of Cabrera to the Spanish continent in such a manner as to prolong the meridian to parallel 39 degrees, so that the arc was exactly cut in the center by the mean parallel. All his preparations were made, all his provisions were taken with the Spanish government, when the death of the captain-general of Catalona, Count Ricardos, threw everything again in question, and arrested his enterprise. He decided then to leave Spain, and being unable to re-enter France, he re-

signed himself to go into Italy. After a number of vicissitudes he reached that country, where he sojourned some time, hesitating to re-enter France in the presence of the political troubles which distracted that country. Finally in the year III., he reached Marseilles almost at the moment when, after an interruption of fifteen months, Delambre was able to resume his measures. Toward the beginning of year IV. he resumed his work in the environ of Perpignan and conducted it toward Carcassona at the cost of great effort.

"You could not have an idea" he wrote to Delambre, "of the difficulty we have to procure wood and workmen for the transportation and establishment of signals on the summit of the mountains. We are obliged to go on foot almost everywhere, and moreover, it is a physical impossibility to make certain stations otherwise, such for example, as Bugarach, which we could not reach except by hanging on to branches and underbrush and by climbing rocks. Night and day we are exposed to storms, having for a bed only a little straw, and for shelter a simple tent, often interrupted and tormented by the clouds which envelop one of the stations and hang over it for entire days. The South wind is terrible in these regions; nothing resists its violence; it is necessary to strike the tents and descend on hands and knees if one does not wish to be carried away as a feather."

All these difficulties did not permit Mechain to reach Carcassona before year V. and it was not until the first month of year VII. that he terminated his work at Rodez.

Less happy in the beginning than his colleague, Delambre, who had commenced by reconnoitering the stations near Paris, encountered unexpected technical difficulties. On the other hand, in the midst of grave events which were happening at Paris, the villagers were inclined to see traitors everywhere; even the proclamation of the king, which had been given to him for a safe guard, caused him to be suspected; at every turn he was arrested and his life was in danger. The distrust of the people gave place to amusing scenes which might have become tragic.

"When I arrived at Saint Denis," he says, "I had to show my passports and I obtained a permit to remain, but the magistrate warned me that even with that aid I would not travel a quarter of a league. And, indeed, a half-hour after, in passing through Epinay we were arrested. They found that our instruments had not been designated with sufficent clearness in our passports; they wished to seize them; I was required to spread them on the ground and explain their use. No one understood the explanation I made, and it was necessary to re-commence for each curious person who came. Vainly I endeavored to interest in my behalf two engineers who were present, endeavoring to prove the affinity of my work with that of their own profession. They saw clearly from the disposition of the minds around that they would only speak uselessly in our favor and dared not give a conclusion. After three hours of debate we were forced to remuont our venicles with an armed guard and were taken to Saint Denis. The place was filled with volunteers who were waiting for their arms to go to the defense of the frontiers. We were compelled to pass through this crowd and at the same time they were excited against us by the titles under which we were announced. I demanded to be conducted to the magistrate who the same morning had given us that permit. During the time we were here they visited our vehicles and found the sealed letter addressed to the officials of the districts which our meridian crossed. They wished to break this seal, but the national guard opposed them, alleging a decree of the Constitutional Assembly. Cries were heard. They demanded the magistrate and me. We descended without verv well knowing what they wished of us. As we were descending the magistrate showed me a place where I could conceal myself and counselled me to wait there and then escape if he delayed more than a few minutes. He returned to announce that the danger was not imminent. They needed me to break the seals. There was a public reading of the letters. One was a circular in which the Committee of Public Instruction of the National Assembly recommended us to all the departmental admistrators. They had already read six of these letters and the tired reader demanded grace. I proposed to take a letter at hazard from those which were still intact and I declared upon my head that they were all alike and I asked that they accept this last proof if it conformed to my statement. The proposition was

accepted, but after examinining the letters they began upon the instruments; they spread them out over the place, and behold, I was forced to re-commence the course of geodesy, of which I had given the first lessons at Epinay. They did not listen any more favorably: the day began to wane; they saw little. The auditors were very numerous; the first rows listened without comprehension; the others further away heard less and saw nothing. The impatience and murmurs commenced; some voice proposed one of the expeditious means so much in use in those times, which, cutting short all the difficulites, also put an end to all doubt. The president of the district had the happy idea of putting off until the following day the examination of all our instruments; but pretending for our safety great severity, he ordered that a seal should be placed on all our effects and our vehicles sent to the guard station. Then we remounted to the room of the commune to sign a report of all that had just passed. It was suggested that I would better write to the President of the National Assembly. My letter, read the next day, was sent to the Committee, who, on the same day, proposed by M. Lacepede a decree which was instantly adopted, the principal provision of which was to recommend us to the administrative corps, municipalities and national guards of all the places where Mechain and I thought we should extend our operations, to see that we were confronted by no obstacles and to allow the free transportation of all of our instruments which we thought we should employ. This decree reached me on the 9th at Saint Denis, where I had kept myself hidden since the adventure of the 6th."

It was in the midst of embarrasments of this kind added to technical difficulties of every kind caused either by the state of the atmosphere or by the difficulty of finding the centers of the old stations, that Delambre pursued his observations. He was on the point of ending the station at Chatillon when a letter from the president of the Temporary Commission of Weights and Measures notified him of the decree of 3 Nivose, year II., enjoining him to cease his work. He was able, however, to obtain authority to finish his observations in course and did not return to Paris until 12 Pluviose, year II., after having finished the station at Orleans. The Revolutionary Committee of his section had put the seals on his house and to obtain their removal he was obliged to give proof of his mission.

Meanwhile the Temporary Committee of Weights and Measures, entirely preoccupied with administrative details did not seem in an hurry to press the measurement of the meridian and the situation threatened to become a lasting one, when the law of 18 Germinal, year III., gave a new impulse to the work. The Commissioners, named by the Committee of Public Instruction (by a decree on 28 Germinal, year III.,) having designated anew Mechain and Delambre for the continuation of the work, the latter after having examined the ground for a new base on the road from Lieusaint to Melun, on 18 Messidor resumed his operations which did not terminate until year VII. The bases of Melun and Prepignan had been measued in year VI.

When these workers, after having made a junction at Carcassona, returned to Paris they found a new Commission called for 15 Vendemiaire, year VII with a conscientiousness which honors them, these two savants profited by this to execute anew their calculations in a manner to set aside all doubt of the authenticity of the results obtained. The calculations were made separately by Tralles, Van Swinden Legendre and Delambre. The comparison of the celestial arc deduced from the observations for latitude with the measured terrestrial arc gave for the flattening 1-334, whence was estimated that one-fourth of the meridian was equal to 5,130,740 toises and a meter to 443,295,936 lines.

While the measurement of the meridian was in process of completion Lefebvre Gineau and Fabroni achieved on their side the determination of the unit of weight, a work remarkable for the extreme care and particular precautions with which it was conducted. Resuming the experiments previously made by Lavoisier and Hauy, they suspended to one arm of a balance by means of a hollow rod which permitted the interior air to communicate with the exterior, a hollow cylinder of brass of which the mean height and mean diameter were measured with most extreme precision as well as the dimensions of the rod. In determining the pull exercised on the arm by the cylinder sucessively plunged into water and in air at a certain temperature, they

concluded that the weight in a vacuum of the volume of water contained in the cylinder was a function of the unit of eight abitrarily employed. In comparing later this unit of weight with the mean mark (8 oz.) of Charlemagne they found that the kilogram should be equivalent to 18,827.15 grains.

During the achievement of this scientific work the public powers began a series of adminístrative measures destined to launch the new system as vigorously and as promptly as possible. A decree of 1 Vendemiaire, year I V, rendered the use of the meter obligatory in the commune of Paris, counting from 1 Nivose following, then in the department of the Seine counting from 10 Nivose and prescribed the progressive renovation of the old weights and measures in all France.

Finally the principle of the new system was inserted in the constitution of the year IV. of which article 371 reads as folows:

Uniformity of weights and measures in the Republic. On 25 Vendemiaire, year VII., the scentific men designated to take part in the verification of the work and definitive determination of the values of the fundamental units met at Paris. They were MM. Æneëæ (Batavian Republic), Balto (Sardinia), replaced later by Vassalli Eandi: Brisson (France), Bugge (Denmark), Ciscar (Spain), Fabbroni (Tuscany), Franchini (Roman Republic), Hauy (France), Lagrange (France), Laplace (France), Lefebvre Gineau (Fance), Legendre (France), Mascheroni (Cisalpine Republic), Mechain (France), Multedo (Ligurian Republic), Pedrayes (Spain,) Prony (France,) Trales (Switzerland), Van Swinden (Batavian Republic).

It is but just to add to these names those of the scientific men who, after having taken an active part in the operations, could not, for various reasons, form a part of the definitive commission, viz: Borda, Lavoisier and Vandermonde, deceased; Bertholiet and Monge, envoys to Egypt; Tillet and General Meusnier, who took an important part in the preparatory work; and the talented artists Lenoir and Fortin who constructed the instruments with a precision heretofore unknown.

Three Commissions were formed.

The special Commission for the quadrant of the meridian and the length of the meter comprised MM. Tralles, Van Swinden, Laplace, Legendre, Ciscar, Mechain and Delambre. Their report prepared by M. Van Swinden, was rendered 7 Floreal year VII.

The Commission charged with regulating and establishing the ratio between the toises of the North, of Peru and of Marian, was composed of MS. M. Multedo, Vassilli, Coulomb, Mascheroni and Mechain. They presented the report 21 Floreal year VII.

The Commission for the determination of the unit of weight was composed of MM. Tralles, Vassalli, Coulomb, Mascheroni and Van Swinden. They gave their report Prairial.

This report and that of the first Commission united and remodelled by M. Van Swinden were read at a general meeting of the Institute 279 Prairal, year VII.

The length of the meter was definitely fixed at 443.296 lines of the toise of Peru.

The weight of a kilogram in a vacuum was fixed at 18,827 grains. According to these data, a certain number of standard meters and kilograms were constructed by Lenoir and Fortin under the direction and surveillance of the scientific men who had fixed their value.

On 4 Messidor, year VII., the Institute presented to the legislative corps the standard models in platinum of the meter and kilogram which were immediately placed in the national archives in execution of article 2 of the law of 18 Germinal, year III.

The two legislative Assemblies gave the honor of a meeting to the commissioners of the Institute and the response of the two presidents witnessed their enthusiasm.

"Your homage, agreable to the Council," said citizen Genissieu, president of the Council of Five Hundred, "will not be less so to the people of France. It will be noticed with interest that in the midst of a salutary crisis and at the moment when the cry 'To arms' was heard, to repulse the barbarians, enemies of all light and civilization, that the constant and persistent work of the savants and artists perfected and executed with the confidence of a strong republican pride this which genius

has conceived in the very midst of the greatest revolutionary movements; so true it is that opposition and resistance to liberal thoughts and institutions are powerless and only give them a new impetus, a new force. While you continue, citizens, to spread instruction and light and to revive public spirit, the Legislative Corps, in concert with the Directory, will strive to bring back order, economy, confidence and happiness; and the courage of France, re-united under the flag, guided by the chiefs who have often led to victory, will again defeat our enemies."

"Behold," in his turn said Baudin (cf (Ardennes,)President of the old Council, "the immortal service which the National Institute has rendered to the French Republic, or rather the benefit it has offered to mankind; for if one discovery of this kind honors both the men to whom we are indebted and the age to which it'pertains, it ought also to pass to succeeding ages and cross over the limits which separate the nations, to form between them a common tie which will unite them."

There remained the formality of fixing the legal value of the meter and kilogram; such was the object of the law of 19 Frimaire, year VIII:

Art. 1—The provisionary determination of the length of the meter as 3 feet 1244 ordered by the law of August 1, 1793 and 18 Germinal, year III, stands revoked and void.

The before mentioned length, forming one ten-millionth part of the arc of a terrestrial meridian from the North pole to the equator is definitely fixed in its agreement with the former measure at 3 feet, 12-000286

Art. 2—The meter and kilogram of platinum sent 4 Messidor last (June 22, 1799) to the legislative Corps by the National Institute of Sciences and Arts, are the definite standards of length and weight throughout the Republic. There shall be sent to the Consular Commission exact copies to serve in the construction of new measures and new weights.

Art 4.—A medal shall be struck off to transmit to posterity the epoch at which the metric system was carried to perfection and the work which served as a basis.

The inscription of the principal side of the medal shall be: To all times, to all nations, and on the reverse, French Republic, Year VIII.

The consuls of the Republic are charged to regulate the other acessories.

Signed: Boulay, ex-president,
Beranger, Ludot, Secretaries.

The consuls of the Republic ordered that the above law should be published, executed and should bear the seal of the Republic.

Made at the national palace of the consuls of the Republic, 19 Frimaire, year VIII. (December 10, 1799).

Signed: Sieyes, Bonaparte, Ducos.

III. The Metric system was founded; but it was yet to undergo numerous vicissitudes before it should definitely come into practice; inopportune measures, such as the decree of 13 Brumaire year IX. (November 4, 1800,) allowing modifications of the nomenclature, and the decree of February 12, 1812, authorizing the construction of instruments of weight and measure, presenting division formerly in use in place of decimal divisions, struck a hurtful blow to the new system. The Restoration did not interest itself in a reform which bore the seal of the Revolution, and it was necessary in order to bring it definitely into practice that the law of July 4, 1837, should render obligatory the use of the new weights and measures. The propagation of the system to other countries offered no less difficulty. The history of this propagation in which the International Geodetic Association took a most influential part would need a special study.

But the advisability of having the same scientific language in all countries was to lead scientists to rally to the decimal sytsem of weights and measures in France, certainly the most simple of all of those in existence.

When the Geodetic Association was founded about forty years ago it had especially for an object the uniting in one single group the triangulations of different countries in view of forming a great chain of parallels or meridians which should serve for the study of the form of the earth, but on comparing the points of junction of the different networks, they failed to express their length in one common unit;

each country at that time had a different unit. The Geodetic Association then thought to found an international bureau for effecting a comparison of different standards of length and to bring them to a common unit. Consequently, when the Association which is now the International Bureau of Weights and Measures was founded, it recognized the necessity of a single unit and it then adopted the meter.

An international convention today regulates the system of weights and measures of the associated countries; the system has for a base an international meter and an international kilogram, the two agreeing with the French prototype; these two standards are deposited with the International Bureau of Weights and Measures of Breteuil, at Sevres.

It is, without question, the institution of this Bureau which has contributed the most largely to the development of the metric system in foreign countries. Along the same line of thought, physicists have adopted a common language for the definition of units employed in physics and mechanics; the unit of force, unit of work, unit of acceleration, etc. They employ the centimetergram second, or, in abbreviation, the c.g.s. system. in which the unit of length is the centimeter, the unit of mass is the mass of the gram, the unit of time is the sexagesimal second of mean time. But here the reform is not complete: the first two units pertain to the metric system, while as to the third, the unit of time, they hesitated to introduce the decimal fraction of a day the one one thousandth part in order to preserve the duodecimal fraction of a day 1-86400 part; the system as thus known is not free from duodecimal complications.

The unit of time remains thus outside the decimal system and it is to be feared that this obstacle will for a long time offer resistance to its adoption in spite of the numerous attempts which have been made and are still being made today.

However this may be, we can say that the end which the promoters of the metric system proposed has been attained. It will be for France, for all the illustrious savants who collaborated in its establishment, and particular for the Academy of Sciences an eternal glory to have accomplished such a reform, which has justly received the adherence of all civilized nations, and in that way, contributed efficaciously toward facilitating their relations and augmenting their accord.

Support for Ratchet Drills.

A NEW and useful tool for attaching drill braces in place while drilling ore, reaming holes in structural iron, such as beams, columns ,angle-bars and the like, has been devised by John F. Steckenreiter, of Chicago, Ill.

He employs a metallic base piece having angular sockets arranged to receive a standard that is secured in the sockets by set screws, the standard carrying a radial arm adapted to support the outer end of the drill. This arm is adjustably mounted on the standard through the medium of a set screw which passes through the hub or sleeve of the arm. The base piece is secured to the beam to be operated upon in the following manner: An angle bracket is adjusted to the base piece by bolts, and it is provided with a flange that engages over the flange of the beam, being secured by set screws. The base piece is provided with hooks arranged to engage over the opposite edge of the flange.

The bracket is first hooked over one side of the beam, after which the hooks of the base piece are engaged over the opposite edge, thus securely fastening the base piece in place. The standard is then inserted in one of the sockets, so that the radial arm will be in position to support the ratchet drill.

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The Industrial Horoscope for 1902.

THE heavy sales of the gross products of furnaces and mills during the last three months, coupled with the disposition of American producers to throw undesired business to the British and German mills, indicates the most tremendous consumption of metal products that the world has ever witnessed. While pig iron production approximates 300,000 tons weekly—at the rate of 15,000,000 tons annually—it is found that, at the prevailing prices ruling in Germany and Britain, we can import with profit, because we can use more pig than we can produce within the period of time it is needed.

Because of the depressed condition of industry and commerce in Germany and Austria-Hungary, due to a number of causes, chief of which is the reaction from inflation of capital and multiplication of establishments since 1893, prices have declined there to the point where exportation of crude iron and steel products is not at present profitable. On the contrary, the tremendous uplift of consumption here, consequent upon the great number and multipled volume of new enterprises requiring a vast tonnage of steel in its many forms, has served to relieve the stringency prevailing in Continental Europe. The effect is not so pronouncedly observable in England, where proverbial conservatism and stolid self-sufficiency seems to have been served with a shock that has produced apathy of effort, except to make outcry. The tone of the British producers and press is distinctly pessimistic as to metal manufacture on a great scale in that country for the future.

Never before was the demand for steel so strenuous in the United States as for 1902. Never were so many vast projects under contemplation at one time, each one of which will require from a few hundreds to tens of thousands of tons to carry them to completion. As one vast project after another is comprehended by public and managers of great enterprises, new and still greater ones seem to be suggested and projected, and all with the view of achieving still greater economy of production or operation.

The railways of the country naturally take the lead in these great projects, urged by the necessity of providing greater accommodations for the expanded and expanding business offered them. This is due to the fact that the minds of the men at the head of them have been directed to the study of ultimate economy within the years elapsing since the dull times set in in August 1893. It is now found that curves and grades on railways are riotous extravagances, and all possible energy governed only by financial cost and ability to meet it is being enlisted to make straight and level lines. At the same time additional new trackage, bridges, terminals, etc., are being provided. In all these vast undertakings large quantities of steel in some form and in many forms is required while the incidental consumption is also greatly enlarged.

While there are not wanting those who think they see a manifestation of evidences that indicate a necessity for prudent exploitation, and even some who foretell a relapse from the present high demand for all products of mines and manufactories, the fact that a general rehabilitation of all the principal railroad lines of the country is necessary and is projected, the work to proceed along orderly lines during a series of years, is one of the best indications of a continuancne of heavy demand for steel and kindred productions. The very considerable enterprises that have been announced by American magnates in foreign countries, together with the activities that may be expected to be aroused as a result of the declaration by Congress that a canal across the Isthmus of Panama is to be constructed under American auspices, is a practical guarantee that a vast volume of business will be available for some time after the end of the present year.

The evidences that are becoming more and more apparent that the crisis is over in Germany is also a good omen.. China's restoration to order is another favoring circumstance that gives rich promise of enlarged business for American mills and factories; but the countless enterprises that are announced, or are under way, in our own country bespeak the continuance of a large volume of business, and this, with what we can find a market for abroad, will keep the industrial concerns of the country pretty busy for a long time.

Enterprise begets enterprise, and the criss-crossing of the spaces between the trunk lines of railway by traction roads, with their attendant developments, is working on the minds of the populace like yeast in a batch of dough. Caution is always in order, but everything points to a year of tremendous energy on an enlarged scale of operations as compared with 1901.

Development of Coal Lands.

RECENT development of bituminous coal lands is remarkable. New mines are being opened every week and the consumption keeps apace with the production. The Pittsburg district is not the only field where coal lands are in demand. West Virginia, Virginia, Ohio, Illinois, Kentucky and other coal producing states are being actively exploited. The Pittsburg district shows the greatest increase. Several new concerns have opened mines along the Monongahela river, new mines are being opened along the Ohio river, to supply the river trade.

President Finley of the Monongahela River Coal Company in his annual report recently called attention to the fact that his company owns enough coal land to continue mining during a generation, at least, and he advised the stockholders that it would be poor policy for the company to purchase additional coal lands which would be a drag on the company instead of giving the stockholders the benefit of dividends during their lifetime. This is much wiser than royalties for idle land which cannot be worked during the life of the present sockholders. If this was followed out by other corporations, coal stocks would be much more valuable than at present.

As to amount of production and value of product in 1900, Pennsylvania ranks first; Illinois second; West Virgnia third in amount, but fourth in value; Ohio fourth in amount but third in value; Alabama fifth in both; Indiana sixth in amount and seventh in value; Kentucky seventh in amount but eighth in value; Colorado eighth in both, and so on.

The general average of price of all coal at the mines in 1900 was $1.14 per short ton as against $1.01 in 1899 and 95 cents in 1898, a considerable increase. The world's production of coal in 1900, as nearly as could be ascertained, was 844,630,413 short tons, of which the United States produced 32 per cent. The coal trade of 1899 was the most remarkable on record, but was surpassed by the results shown in 1900.

Some Natural Gas Statistics.

The quantity of natural gas sold in 1900 was about 19 per cent more in value than in 1899. There were 10,506 producing wells at the close of 1900, a gain of 768 wells. The total length of natural gas mains of two inches and larger reported in the United States in 1900 was 21,048 miles. A general decline in gas pressure has been felt. The value of the gas sold or consumed in the leading States was, in round numbers: Pennsylvania, over $9,000,000; Indiana over $6,000,000; Ohio over $3,800,000; West Virginia over $1,500,000; New York nearly $1,500,000. The total gas sold or consumed in 1900, $23,606,463, is estimated to have displaced other fuels valued at $29,191,710.

Companies or individuals, to the number of 1,438 report natural gas used in 706,309 domestic fires, 74 iron mills, 9 steel works, 209 glass works and 5,387 other establishments—a total of 5,679 establishments. Natural gas was brought by pipe lines from Canada in 1900 and marketed at Detroit, Buffalo and Toledo, where its value for the year was $672,362. The value of the natural gas produced in Canada in 1900 is reported at $417,097.

IN AND ABOUT PITTSBURG.

The tube department of the Carnegie Tube Company, Carnegie, Pa., was put into operation last week and will be operated on a night schedule beginning this week. The skelp mill will be ready for operation by February 10. The plant will produce wrought iron tubes from 1/8 to 4 inches and will have a capacity, when in full operation, of 100 tons a day. The officers of the company are: A. G. Hutchinson, of New York, president; R. N. Vincent, vice-president O. G. Grant, treasurer, and T. B. Everson, general manager.

The Redding Engineering Company, recently organized, to manufacture pumping machinery and steam specialties, has its plant at 3173 Second avenue, this city, in partial operation. The plant comprises a brass foundry, machine shop, and pattern shop, and is equipped with the latest improved machinery. Steam pumps up to 2,000,000 gallons' capacity will be built. Thomas Jelley is president of the company; H. B. Redding, vice-president and general manager; and F. E. Redding, secretary and treasurer.

The 128-inch mill of the Homestead steel works broke the world's record last Wednesday, for a 24 hours' run on sheared plates. The 24 hours ended at 6 o'clock that night when there were 1,049 tons to the credit of the mill. The previous high record was made by the same mill some time ago, when there were 788 tons rolled.

A preliminary injunction was issued a few days ago in the equity case of J. Solomon against the Pheonix Foundry Company, restraining the disposing or encumbering of the assets of the company. The court also appointed Robert McMillen receiver of the company, having found that the concern is insolvent.

Plans for the blast furnace plant to be erected at Du Bois, Pa. for the Rochester and Pittsburg Coal and Iron Company will be prepared by Julian Kennedy, mechanical engineer, of this city. Thomas W. Kennedy, formerly superintendent of the Isabella furnace, will superintend the construction of the plant and will be placed in charge when completed.

The Buckeye Engine Company, Salem, O., through its local representative, received an order from the Standard Steel Car Company for three 650 horse power engines. The Buckeye Engine Company will also supply the National Mining Company with two 300 horse power engines, to be direct-connected to generator.

The Eclipse Manufcturing Company, of this city will double the present capacity of its rivet department by the addition of two automatic rivet machines. The company is operating its plant on a night schedule and reports a heavy demand for rivets, forgings and upsets.

Work will be started this week upon the erection of a building in Smallman street, near Twenty-eighth, to be used by the A. W. Cadman Manufacturing Company, this city, as a brass foundry and machine shop. The building will be completed and ready for operation by the middle of March. The company has sold its present plant in Water street to the Wabash system and is preparing to more than double its present output on removal to its new plant. The company makes steam specialties and reports a heavy deman for the Cadman indestructible blow-off valve, aluminum Babbitt metal, and gage cocks.

The National Gear Wheel & Foundry Company received orders recently through J. D. Lyon & Company, merchant engineers, this city, for five 60 horse power "Mertes duplex" gas engines, distributed as follows: The Pittsburg Clay Pot Company; Chillcott-Evans Chain Company; C. K. Hill; F. H. Bruening; and the Keystone Mattress and Bed Spring Company.

The examination of the sales sheets of the American Sheet Steel Company for the 60 days ending December 31 to determine the wage rate for sheet steel workers for the 60 days beginning at that date was held January 15 and permitted no advance in wages for the workers.

The Union Shovel Company, South avenue and Snowden street, Allegheny, is preparing for an increased capacity for the manufacture of a complete line of shovels. The company reports an active demand and will increase the output 25 per cent.

B. S. Northrup advises us that the strike reported at his foundry, at Washintgon, Pa., was an error. The report came from Washington, but Mr. Northrup states that he never had a strike in any department of his business.

An order for the largest single piece casting ever made in this state has been received by the Pittsburg steel foundry at Glassport from the Westinghouse Electric Company to be in a solid piece weighing 50,000 pounds.

The contract for the tipple work and incline machinery to be installed at the coal mining plant of the Norris Mining & Manufacturing Company, New Salsbury, O., was awarded W. W. Rosensteel, Iron Exchange building, in this city.

NOTES OF THE INDUSTRIES.

The Greendale Coal Company, of Columbus, O., whose interests are located in the region of Murray City, in Athens county, was sold outright January 17 to the Pittsburg Coal Company, of Pittsburg, which, early this week, secured possession of the New Pittsburg Coal Company, also of Columbus. The Greendale company controlled about 800 acres and had a daily output of 1,700 tons. It was capitalized at approximately $200,000. As soon as the deal was completed Charles Boardman, of Columbus, principal officer and owner of the Greendale company, resigned. Mr. Boardman is heavily interested in the Tidewater Coal & Coke Company which owns 4,000 acres of coal land at Vivian, W. Va., and intends to devote his entire time to this property, which is to be greatly improved.

General Daniel H. Hastings, Colonel J. L. Spangler and others, have sold 5,000 acres of coal land in Susquehanna township, Cambria county, and Green township, Indiana county, to a syndicate of Eastern capitalists residents of Philadelphia and New York. The price paid was in the neighborhood of $100 an acre. It is understood that this property will be placed under operation within a year, which will necessitate the building of a branch road about five miles in length up Moss creek, along which the recently sold mineral lands are located. This branch will connect with the Susquehanna branch of the Cambria & Clearfield division of the Pennsylvania railroad at Spangler and all of the coal will be shipped over the Pennsylvnia railroad.

The Atchison, Topeka & Santa Fe railroad will spend $13,000,000 from the proceeds of a new bond issue of $30,000,000 this year for equipment. An order has been given for 5,000 box cars, 50 heavy freight engines and 100 engines of smaller type, and practically all of the passenger equipment is to be renewed. It will take fully $12,000,000 to give the company over 300 miles of new line free from debt. Fully $2,000,000 will go toward the new San Francisco terminals and the balance of $3,000,000 will be used for grade reductions, etc. It is stated unofficially that a Chicago St. Louis line by the way of the Chicago, Peoria & St. Louis road is contemplated.

A mortagage of $2,500,000 one of the largest recorded in Philadelphia, for a long time, was filed January 17. The mortgage was given by the Chicago Pneumatic Tool Company, of New Jersey, to the Central Realty Bond and Trust Company as security for bonds issued to that amount by the company. The mortgage is placed on the plant of the tool company at Detroit, and formerly owned by the Boyer Machine Company, limited. The concern also has another large plant at Tabor, Pa.

Wickes Brothers announce that the increased interest in the Wickes vertical water tube boiler has made it necesary to increase their force, and that George F. Lemon, formerly connected with the Chicago office, has been transferred to the Pittsburg office to take charge of the new boiler deparment. The capacity of the works at Saginaw, Mich., has been more than doubled in the past year, and the company is prepared to offer boilers for comparatively prompt shipment.

The Akron Gear Company has the plant of the Holman Gear Company of Valparaiso, Ind., and will move it to Akron, adding by this about one hundred men to the payroll of the Akron factory. Akron's two wagon and carriage gear factories will turn out more gears than any other city in the United States.

The Cambria Steel Company, now controlled by the Pennsylvania railroad, will hold its annual meeting this week. It is officially stated that the profits applicable to dividends amounted to $1,350,000 for the six months of operations under new conditions. The dividend of 75 cents a share only recently declared on 900,000 shares requires $675,000. The old company showed the profits in excess of $3,000,000 for the fiscal year ended October 31, 1900.

It was officially announced January 20 that the earnings of the American Locomotive Company from June 15 to December 31, last year, were estimated conservatively at $12,515,041, and expenses at $10,839,653. It is the policy of the company to devote all surplus after preferred dividends to enlargements and betterments of various kinds.

The directors of the National Bridge Company January 20 declared the regular quarterly dividend of 1¾ per cent each on the common and preferred stock. The Colorado Fuel Company also declared the regular semi-annual dividend of 4 per cent on its preferred stock.

Arrangements are under way for an early resumption of the Valentine Iron Company's plant. This plant has been idle two years and was recently sold at sheriff's sale for $84,000.

The Shelby Steel Tube Company put up prices an average of about 10 per cent on cold drawn seamless tubes. The advance has gone into effect.

IRON AND STEEL TRADE,

PRICES AND CONDITIONS.

PITTSBURG—The better run of coke has put the blast furnaces at some ease and the supply of pig iron is considerable stronger. The market maintains its solidity at the same time and the ruling rates on all products cannot but be maintained for the first half of the year at the shortest. The normal supply of cars has not been reached but the improvement has been sufficient to give ease to both producers and consumers. There have been no repetitions of the recent heavy sales in pig iron but the current volume is strong, all things considered. The current buyers make no protest against the rate of $16.00 and $16.25, at valley furnace, which is equivalent to $17.00, Pittsburg, at the higher quotation. With further improvement in the run of cars for fuel supply and transportation of iron from furnaces, the current maximum may drop to $16.00 at furnace but hardly lower for several months. Mill iron is still strong with a good tonnage moving. During the week some 6,000 tons were sold at $16.25, at Pittsburg. Billets are still scarce and command the usual high prices $27.50 to $28.50, at mill.

In the finished steel lines there is the same relative improvment in production and shipments, and deliveries held over from last year are almost out of the way except in a few instances.

The current demand holds good and from the outlook there will be a scramble for material of all kinds all through the year. The current buyers will be compelled to pay the highest notch rate by the time the first quarter has ended as in the majority of cases the bulk of the tonnage for the whole year has been covered by contract. No changes in prices have been made during the week but the market is rigidly strong.

CURRENT QUOTATIONS:

Basic	$16 75		Splice bars	1 50	
Bessemer	16 75	17 00	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 00	Z beams	1 60	
Fdy 2, Nhn		16 75	Channels	1 60	
Fdy 3, Nhn		16 00	Boiler plates	1 75	
Mill Iron	16 25		Fire-box	1 85	
Fdy 1, Shn	16 65		Sheared	1 65	1 75
Fdy 2, Shn	16 40		Tank	1 69	1 70
Fdy 3, Shn	15 65		Steel melt'g scrap	14 00	
Grey Forge, Shn.	15 10		No. 1 wrought	15 50	
Bessemer billets	27 50	28 00	No. 1 cast	13 00	13 25
Open hearth	29 00	30 00	Iron rails	21 50	
Steel bars	1 60		Car wheels	17 50	18 00
Iron bars, refined.		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Bolts, iron, sq nut.	2 50		Sheets, 26	3 00	
Hex nuts	2 65		Sheets, 27	3 10	
Standard sections.	28 00		Sheets, 28	3 20	
Spikes	2 00				

PHILADELPHIA—The whole iron and steel market is as strong as it possibly could be, and it is certain that present conditions in the trade are assured for the first half of the year. Sales of pig iron so far this month have been heavier than in the whole of December, which was a record month in the volume of business transacted. There has been considerable activity, too, in the Central West in forge and foundry irons. In the East round lots of basic iron have been taken by different interests, aggregating about 15,000 tons. There is also a good demand for nearly all kinds of finished iron and steel products, and the tone of the market is firm. The troublesome car shortage seems to be gradually bettering itself. Last week the car service was better than it has been since the middle of November. It has continued this week in a way which promises gradual improvement. The furnaces and mills are getting their requisitions in all raw materials more promptly.

In the local pig iron market prices are getting extremely difficult to follow, as every seller makes his own price. Some are willing to sell at a price which depends to a great extent on the dates of delivery, but there are very few that are in a position to offer anything within there or four months, all their output being engaged for that time. The frequent shutdowns, and the uncertain supply of raw materials have run up cost in many localities until the situation of the maker is worse than it was before the improvement in prices commenced.

Steel billets are being offered at $30, prompt delivery, but as yet very little business has been done at this figure.

Trade in manufactured iron and steel continues good, and prices are firm all along the line. A very heavy tonnage is constantly being booked for structural material, and the outlook is that the mills will be pushed to full capacity all this year to get out tonnage as fast as needed. The tone of the sheet market is strong, but it is not likely that prices will be any higher, as many independent mills have come in the market recently and are actively seeking business. The plate mills are comfortably supplied with orders, and there appear to be good prospects for a continuance. It is reported that some of the bar mills are running short of work.

The Mexican National order for 105,000 tons of rails has been equally divided between German and American makers. Part of the 50,000 tons ordered in this country will probably be rolled in England. Standard sections continue to be quoted at $28 at mill.

CURRENT QUOTATIONS:

Foundry, 1	$17 25		Girder rails	32 00	32 50
Foundry, 2	16 50	17 00	Angles, 3" & lr'gr	1 75	1 80
Gray Forge	16 00	16 50	Under 3-inch	1 85	1 90
Bessemer billets	29 00	30 00	T's 3" and larger	1 80	. 85
Open h'rth bil'ts	30 00	31 00	Under 3-inch	1 85	1 90
Steel bars	1 70	1 80	Heavy plates	1 75	1 80
Refined iron bars	1 90		Beams and chanls	1 75	1 85
Standard rails	28 00				

NEW YORK—The first two weeks of the new year confirm the hopeful view with which the old year closed. Generally speaking, it may be said that the business for the first half of 1902 is done. This relates not only to ore, coke and pig iron, but to rail, structural forms, bars, sheets and most other lines which make tonnage. The business now current runs largely toward the third and fourth quarter of the year. Belated buyers who need further supplies for the first half are having their troubles. The contracts that are being placed for the third and fourth quarters of the year are the best evidence of the sentiment of the trade with respect to the future. It is often remarked by experienced manufacturers that the long look ahead has not been so clear for decades past. It is not doubted that troubles will come in time but the prospect is singularly free from them at the moment.

While in sections serious trouble is still experienced from the car famine, yet there is substantil relief at most centers and hope is entertained that the great manufacturing and mining interests may soon be free from this nightmare. December was a month that heavy shippers do not want to see repeated.

For the first time the English iron trade is beginning to lift up its head. Prices of Scotch and Middlesboro pig have advanced twenty-five cents a ton during the week under improved demand and better feeling. There are signs also that in Germany the process of liquidation is well advanced.

The iron trade views with satisfaction the further cuts in copper. Just as the abnormally high figures of the past year tended to restrict new operations in certain lines, so the abnormally low figures now current should stimulate demand.

The price changes of the week have been unimportant but have all been in the direction of firmness. The basis of $12.00 Birmingham, and $16.00 Lehigh valley, for No. 2 foundry, and $16.00 at valley furnaces for Bessemer, is now well established.

CURRENT QUOTATIONS:

No. 1X fdy North Jersey City	$17 25	Angles	2 00	2 50
No. 1X fdy Jersey City	17 00	Tees	2 00	2 50
No. 2 plain Jer. C.	16 65	Zees	2 00	2 50
South. 1 fdy N. Y.	17 50	Time deliveries, basis $1.75 for angles, beams and channels,		
No. 2 fdy N. Y.	17 25	Com. base, bars per 100 lbs	1 85	1 90
No. 3 fdy N. Y.	16 50	Refined base, bars	1 90	2 00

No. 1 soft	17 50		Bands, base	2 40	2 50
No. 2 soft	16 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	19 00	20 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 00	17 00
Mach. steel, base, at store, N. Y, per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10		Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	9 00	10 00

CINCINNATI—There is no appreciable change from the conditions of a week ago except that transportation has improved slightly in some districts, facilitating somewhat movements of iron and coke. Some of the transfer points are still badly congested. Railroad officials are earnestly at work and, if the weather is not too severe, will certainly better conditions though necessarily gradually.

Demand continues active, though for foundry and mill grades not quite so large, and while the easing up is only enough to be perceptible, it is very welcome. The orders the past week have been principally for deliveries beginning May and beyond.

Supplies for early delivery are confined largely to silver greys and off foundry grades.

Furnace stocks went off during December, 19,236 tons. The total unsold stocks at the furnaces January 1 are reported as 217,023 tons, the smallest since March, 1900.

While the American Iron & Steel Association has not yet given out its report as to the total pig iron production in the United States for 1901, eminent authority announces it was 15,801,-813 gross tons. The furnace stocks January 1, 1901, were 609,692 tons. Deducting total stocks January 1 would indicate that consumption of 1901 was 16,194,442 tons.

Prices on Lake Superior ores have not yet been established and in consequence the ore cost of Northern pig iron the coming year is not settled.

Customers in every direction have been suffering for an ample supply of iron, but it is reasonable to believe that with a more liberal supply of coke, now apparently promised, the Northern furnaces will be able to produce more liberally, and the holiday season being past in the South a large production is reasonably expected from that district, so that the indications favor an improved condition generally.

The market closes in good form with prices current very firm.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	[illegible]	Steel [illegible]	[illegible]	2 50
South fdy. 2	14 75	[illegible]	Sheet [illegible]	[illegible]	
South. fdy. 3	[illegible]	14 50	[illegible]	[illegible]	3 35
South. fdy. 4	[illegible]	[illegible]	[illegible]	3 45	3 50

Grey forge	13 75	14 00	Angles, 3 to 6 in.	1 75	2 50
Mottled	13 75	14 00	Angles, 1¼ to 2½	1 75	2 50
Shn. 1, soft	15 00	15 25	Beams and Chanls		
Shn 2, soft	14 50	14 75	15 in and under	1 75	2 70
L. Superior, fdy. 1	17 25	17 50	I b'ms 18, 20 24 in	1 80	1 50
L. Superior, 2	16 75	17 25	Tees	1 75	1 85
L. Sup'r char'l c w	19 50	20 00	Z's	1 70	1 80
Haug'g r'k ccl, 1	20 00	21 50	1 wrought scrap	12 0[illegible]	13 05
Sohn ccl c w	18 75	19 25	Steel mlting stock		
Jaksn cy. silv'y 1	16 70	17 00	gross ton	11 50	
St'l brs base hlf ex	1 75	1 90	No. 1 cast	11 00	
Iron bars	1 75	1 90	Old iron rails g t'n	15 00	
Flange plates	1 82	1 92	Old car wheels	14 50	
Tank steel	1 72	1 82	Cast borings	5 00	
Ordinary fire-box	1 92	1 97	Turnings	5 50	
T rails	36 00				

CHICAGO—Pig iron continues to grow in strength. It is difficult to say what the price of local iron for quick shipment is, because of the paucity of transactions but the levels may be regarded as fifty cents higher. Southern iron also is stronger. There is practically none for sale in considerable lots for delivery during the first half of the year. The current car load trade, representing those small buyers who do not make contracts, is paying $12.50. Birmingham, or $16.15, Chicago, for No 2. foundry, though requirements for the last half of the year may be arranged for somewhat lower. Large consumers are ordering quite a large tonnage for future wants.

Finished material maintains its firm attitude. There is a continuation of the previously noted tendency among large users to extend their orders into the last half of the year, though this movement is not general and is not expected to be until something more definite is known regarding tne crops, especially among the implement makers, who represent a large per centage of the buying in this market. There is a strong undertone to the market and the common complaint is that delivery is uncomfortably slow.

For all kinds of scrap there is a demand willing to take everything offered provided prices are satisfactory. There is perhaps no general change in the levels but some grades are bringing about fifty cents more than they did a week or two ago.

CURRENT QUOTATIONS:

Bessemer	17 50	18 00	Sheets, 26 store	3 15	3 25
Fdry Nohn 1	16 50	17 00	No. 27	3 25	3 35
Northern 2	16 00	16 50	No. 28	3 35	3 45
Northern 3	15 50	16 00	Angles	1 75	
Southern 1	16 40	16 90	Beams	1 75	
Southern 2	15 90	16 40	Tees	1 80	
Southern 3	15 40	15 90	Zees	1 75	
Forge	14 90	15 40	Channels	1 75	
Charcoal	19 00	20 00	Steel melt'g scrap	13 50	14 00
Billets, Bessemer	30 00	32 00	No. 1 wrought	15 50	16 00
Bars, iron	1 65	1 70	No. 1 cast, net ton	12 00	12 50
Bars, steel	1 65	1 70	Iron rails	21 00	22 00
Rails, standard	28 00		Car wheels	16 00	17 00
Rails, light	31 00	34 00	Cast borings	5 50	6 00
Plates, boiler	1 90	2 00	Turnings	10 00	10 50
Tank	1 75	1 80			

BIRMINGHAM—The Southern iron market has adhered to a $12 basis for No. 2 foundry ever since the new year began and that basis seems to be as firm as any lower price. Indeed the only fear the Southern operators have now is that the price of pig iron will advance further. They do not desire that. Roseate views of the situation and prospects are taken by all authorities including President Hopkins' of the Sloss-Sheffield Steel & Iron Company, who says the year holds out the best prospect he has observed in ten years.

The big rail mill of the Tennesse Coal, Iron & Railroad Company, at Ensley, is gradually going into operation and several lines of railroad tending to open up new mineral territory have either been completed within the past month or so or are under way. The Central Foundry Company and the Central Coal & Iron Company promise substantial developments in Tuskaloosa, the plants including everything from the mining of the raw material to an output of soil pipe. Stocks of steel are said to be accumulating at the Ensley plant and some stocks are accumulating at the rolling mills, it is understood, but it is claimed that these accumulations are only temporary and owing to a scarcity of cars. A number of corporations have made flattering reports of the past year's operations, especially the Bessemer Land & Improvement Company, which shows great increase in production and declare a nine per cent dividend. Raw steel is worth about $27 per ton and is firm at that figure.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 00	12 50	Tank	1 80	
No. 2 fdy. Sohn	11 75	12 00	Steel smelt'g scrap	14 00	
No. 3 fdy. Sohn	11 00	11 25	No. 1 wrought	14 00	
Grey forge, Sohn	10 50	10 75	No. 1 cast	12 00	
Billets	27 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 0[illegible]	[illegible]
Boiler plates	1 90		No. 28 sheets	3 10	[illegible]
Fire box	2 00				

The oldest industrial plant in Scranton, Pa the rolling mill of the Lackawanna Iron & Ste Company, built in 1847, rolled its last rail la week. Its demolition has been begun a its machinery will be removed to Stony Poi near Buffalo, where the company's new wor are being put up. Thomas Byron, the man w rolled the first rail in the mill 54 years ago, n nearly 80 years old, guided the last rail whi the mill rolled.

Coal.

PITTSBURG—The deliberations over higher tranpsortation charges and the forecast from the miners' convention at Indianapolis that the wage cost for the approaching scale and contract year will be at least 10 per cent higher have been the events of the week. For some time it has been a foregone conclusion that coal would be considerably higher in cost to consumers than last year and events about to develop into facts all tend to confirm that view. Fuel will be much higher this year unless the unexpected happens.

CHICAGO—There has been marked improvement in the coal supply during the last week, especially from the East. Receipts have been twice the size of those to which the trade has become accustomed. Even with this gain, however, the market readily absorbed the entire arrivals. Western coals were also in better supply. The car question seems to have been entirely eliminated and production is not at all impeded in Indiana and in Illinois from that cause. The price of Western coals is down to the low level prevailing before the quick rise just before Christmas. But there is no surplus stocks on hand and severe weather, in the opinion of large sellers, would result in a return of the scarcity. Coke also is arriving more freely but not in sufficient q antities to permit the re-opening of all the idle blast furnaces. Five or six are still idle, but the number is decreasing and in two weeks, if the present rate of improvement continues, all will be in blast.

Coke.

The car supply in the Connellsville coke trade was not quite up to the high mark of the week previous, but a heavy shipment was made. Shipments to Pittsburg furnaces were larger but Eastern and Western shipments show a light decrease. Operations were slightly over an average five days' run, production amounting to 220,671 tons, an increase of 2,828 tons.

The railroads are apparently getting better control of the trade and are moving the coke trains with much more speed. The output last week was from 20,000 to 30,000 tons greater than production and the transportation companies promise a still larger movement with the coming weeks and a gradual lessening of the surplus coke piles on the yards. Efforts will be directed in this line and a number of the plants kept in the five day list until the congested condition of the yards is relieved. Coke stocks at the furnaces are reported as gradually gaining and less delays in deliveries. With an improved car service there is nothing to disturb the coke trade and every indication points to a record breaking trade for the year.

A summary of the Connellsville region for the week shows 20,395 ovens in blast and 1,120 idle.

The following figures show the scope of operations.

Production for the week	220,671 tons.
" last week	217,843 tons.
Increase	2,828 tons.
Shipments for the week	11,340 c"rs.
" " last "	11,417 cars.
Decrease	77 cars.
Shipments in tons for week........	252,315 tons.
" " " last week........	254,028 tons.
Decrease	1,713 tons.
Masontown Field	
Shipments for week	567 cars.
" last week................	527 cars.
Increase......................	40 cars.
Shipments in tons..................	14,762 tons.
" last week................	13,702 tons.
Increase	1,060 tons.
Distribution—	
To Pittsburg and river points........	3,490 cars.
To points West of Pittsburg........	5,715 cars.
To points East of Everson............	2,135 cars.
Total	11,340 cars.

Coke Prices.

Pittsburg—Furnace, $2.25@2.50. Foundry, $2.50@2.75.

St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50

Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.25@4.50 onega, $4.25.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including January 20, 1901:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUN
Transit	479,098	278,9?9
Tidewater	125,978	61,963
Southwest	41,058	167,110
Eureka	23,207	634,700
Buckeye. Macksburg oil	79,591	247,308
New York Transit	457,743	
Southern	876,[illegible]89	....
Crescent	104,787	....
Total	1,687,801	1,397,954
Daily averages	88,684	73,577

LIMA.

Buckeye / Indiana Local Division	965,923	960,223
Daily average	50,338	50,538

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
January 15	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
January 16	1.30	1.15	1.15	0.83	0.80	0.80
January 17	1.30	1.15	1.15	0.83	0.80	0.80
January 18	1.30	1.15	1.15	0.83	0.80	0.80
January 20	1.30	1.15	1.15	0.83	0.80	0.80
January 21	1.30	1.15	1.15	0.83	0.80	0.80

OBITUARY.

JULIUS PRAGER.

Julius Prager, aged 63, died last Sunday at his home 6 Seneca street. Mr. Prager was born in Baden, Germany, and came to this country in 1858. He served three years in the army during the Civil War and was taken prisoner three times. He came to Pittsburg about thirty-four years ago and engaged in business on the South Side, afterward moving to 110 Market street, where he conducted a gas engine and safe business at the time of his death. A son of Mr. Prager, Benjamin, is a member of Company A, Nineteenth infantry, United States army, now on duty in the Philippines. Mr. Prager was a member of William Tell Lodge, Knights of Honor. He is survived by a widow and four children, William, Benjamin, Rose and Daisy.

JOSEPH G. WAINWRIGHT.

Joseph G. Wainwright, president of the Basic Brick Company, whose works are in Johnstown, died last week at his home in East End, Pittsburg. He had been suffering for six months with sarcoma, for which he underwent an operation in New York about three months ago. He declined rapidly during the past few days. Mr. Wainwright was well known in Pittsburg business and manufacturing circles. Besides his connection with the Basic Brick Company, he had for some time been president of the Armenia Insurance Company and the Fayette Manufacturing Company. Mr. Wainwright was married to Miss Margaret Riddell, who died about twelve years ago. He is survived by a son and a daughter.

Ore Talk in Cleveland.

Since the meeting of the Lake Carriers' Association rate talk has been revived, in a measure, among the vessel owners. The last few days have brought out certain features which have added a great deal of strength to the situation. For instance, the meeting of the Ore Association showed that the production of ore the coming year will only be limited by the melting capacity of the furnaces and by the lake facilities for carrying and transferring. This being the case, the vesselmen argue with excellent justice that there is to be a great demand for ships. The total shipment last year was 20,000,000 tons. The present outlook is that an increase of 5,000,000 tons during the year is not unreasonable. The additional vessel capacity produced during the winter will not exceed 3,000,000 tons, even if it figures up that rather surprising total.

The movement of 5,000,000 tons more of ore will mean that the new boats will be kept busy, and that the boats which engaged in the ore trade last season will have to do 2,000,000 tons better than they did. That the boats will be able to do what is to be required of them is not doubted, but a question is raised by the vessel owners as to whether the railroads attending the South shore ports will be able to handle their proportion of the increased business. There are many doubts on this point which are having a big influence on the action of the vessel-men in making rates for the coming year. Without increases in the railroad facilities the increase in the ore shipment will mean greater delays at the docks, and the vessel owners will demand a better rate of carriage to counteract the loss through these delays. A few days ago the vessel interests were willing to compromise on a basis of ninety cents from Duluth, but now it is said that they will hold tenaciously to the $1 rate.

Another consideration is also causing some of the vesselmen to hesitate. It is known that the coal trade this year will be much heavie than last season. The stocks in the Northwes are running very low and there will be an earl demand for coal, which was not true last sprin In addition, the shipment through the year wi be much heavier so that a repetition of th winter's shortage in the upper lake region m be avoided. The consideration of a possible de lay at the docks for ore vessels, and the possib need for tonnage in the coal trade all summ is causing the vesselmen to think seriously refusing to make contracts and to rely up wild chartering for their earning the comi summer.

The Huntington, W. Va., plant of the Americ Car & Foundry Company has orders for a great number of cars than it ever had at the brighte period in its history, 2,500 in all. It has just r ceived an order for 500 gondola coal cars of tons' capacity for the Hocking Valley Railw Company, and the recent order of the Norfolk Western for 1,000 gondola cars of 40 tons' cap ity, with steel under-framing, was increased l Saturday to 2,000 cars.

The Metal Markets.

LONDON—Tin—£106 5s-£104 10s. Sales, tons spot; 410 tons futures.

Copper—£48 10s-£45 10s. Sales, 1,050 tons sp 1,600 tons futures.

Lead—£10 10s-£10 5s.

Spelter—£16 15s-£16 10s.

NEW YORK—Tin—$24.25-$23.55.

Copper—Lake, $11.25-$11.12½ electroly $11.12½-$11.00; casting., $11.00-$10.75.

Lead—$4.00.

Spelter, $4.37½-$4.32½.

Personal.

William H. Schoen has resigned as first vice resident of the Pressed Steel Car Company. The resignation was handed in some weeks ago, but Mr. Schoen was asked to continue to serve a his position until January 22, the date of meeting of the stockholders of the company. Mr. Schoen is the last of the original incorporators of the company to leave that concern.

Leon E. Thomas has been appointed assistant superintendent at the works of the Lloyd Booth department of the United Engineering & Foundry Company. He entered upon his new duties Monday. Mr. Thomas was assistant master mechanic at the Ohio plant of the National Steel Company, in Youngstown.

S. A. Williamson resigned last week as the Pittsburg representative of the Heine Safety Boiler Company, and will assume charge of the water tube boiler department, at Chicago, of the Erie City Iron Works. Mr. Williamson has had charge of the Pittsburg office of the former company for the past four years.

Perry D. Mackey, one of the superintendents the converting department of the Edgar Thomson steel works at Braddock, has left for Youngstown, O., to become general superintendent of the converting department of the Republic Iron & Steel Company's plant.

A. R. Fraser, who some weeks ago tendered his resignation as secretary and treasurer and a director of the Pressed Steel Car Company, will, after the annual stockholders' meeting January 22, become a director and treasurer of the new Standard Steel Car Company.

John A. Wood, Jr., formerly in charge of the engineering corps of the Monongahela River Consolidated Coal & Coke Company, has acquired interest in the Robinson Machine Company, Monongahela City. Pa., and will look after the outside interests of the company.

John Dowling, for years superintendent of the Bessemer division of the Tennessee Coal, Iron & Railroad Company, has resigned, his resignation take effect February 1. Who his successor will be has not been stated.

F. E. Taylor, general manager of the Republic Iron & Steel Company, Youngstown, has resigned. He has been succeeded by W. L. Simonton, general manager of the Emlyn iron works, at Chicago.

F. R. Palmer, of Cleveland, formerly superintendent of the casting department of the American Steel & Wire Company, has been appointed general manager of the Youngstown Steel Casting Company.

Andrew J. Welsh, of Youngstown, has been appointed master mechanic of the St. Louis and Detroit mills of the American Foundry, Forge and Car Company. He assumed his new duties Monday of this week.

J. O. Crawford, formerly with the H. Q. Hickman Company, this city, has assumed the mangement of the Manufacturers' & Producers' Supply Company, this city.

Albert Schall, foreman for the Pullman Palace Car Company, in Wilmington, will go to Niles, O., to become superintendent of the Niles Car & Manufacturing Company.

Milton McDonald has been appointed night superintendent of the converting department of the Bessemer plant of the Republic Iron & Steel Company.

Superintendent Edwin H. Martin, of the Diamond State Steel Company, has resigned to accept a similar position with the Carnegie Company.

The River Coal Report.

The annual meeting of the stockholders of the Mononaghela River Consolidated Coal and Coke Company was held January 15. The following directors were re-elected: J. B. Finley, George W. Thies, H. C. Fownes, S. S. Brown, Hugh Moren, August Jutte, O. A. Blackburn, George I. Whitney and W. E. Rodgers. The annual statement of President Finley showed an increase of cash on hand of $64,189.51; accounts receivable, $820,-891.22, and of coal on hand $252,123.45. The total value of the coal on hand is placed at $1,328,529-.61. The current debts are $3,510,751.32, an increase over last year of $1,361,280.32. The undivided profits were $361,374.50.

During the year bonds to the amount of $349,-000 were paid and cancelled. The earnings were $2,906,354.62. Of this, $2,544,980.12 was expended for general expenses, taxes, interest and discount, maintainance and repairs on river craft, depreciation in river craft, royalty on coal mined and interest on bonds paid. This left balance for the year of $361,374. The net balance last year was $495,686.62, making the total now $857,061.12.

President Finley explained that the current debt is wholly due to the growth of the business, but the increase is more than offset by quick assets, which amount to $220,626.85 more than the current debt. He stated that the company purchased an acreage equal to that mined during the year. He mentioned improved steamers and mine installation. President Finley stated that the company has improved since its organization, both in financial and physical condition, and he declares that the present outlook warrants the expectation of continued prosperity.

Workmen Prosecute A Manager.

The grand jury of Columbiana county, O., has indicted D. Spencer Brookman, manager of the sheet plant of the American Sheet Steel Company. The indictment charges unlawful coercion, and says that December 2, Brookman, acting as manager in charge of the works of the Wellsville plant of the American Sheet Steel Company, discharged Leonard Schaeffer from the mill solely because of his connection with the Amalgamated Association of Iron, Steel and Tin Workers; also that Brookman did unlawfully attempt to coerce Schaeffer to leave the association and cease being a member.

The indictment is under a new Ohio statute, which forbids the discharge of workingmen by their employers simply because they belong to a union. The penalty in case of conviction is a fine not exceeding $100 or imprisonment not exceeding six months, or both at the discretion of the court. It is alleged that Brookman discharged Schaeffer for no other reason than that he would not give up his union card.

A vigorous fight is to be made to have the higher courts define the rights of a union man in Ohio, and the constitutionality of the law under which action is brought. The statute has never before been invoked, and Schaeffer's case will be one of rare interest. It is understood that President Shaffer, of the Amalgamated, and the whole association will back the Wellsville men in the fight they are making. Manager Brookman has retained ex-Judges P. M. Smith and N. B. Billingsley, of Columbiana county, as his counsel. Prosecuting Attorney J. H. Brookes will conduct the case for the workingmen.

Will Not Use Scrap Sheets.

W. H. Foster, secretary of the Youngstown Iron, Sheet & Tube Company writes us as follows on a point of interest to the trade:

"The local evening papers have announced that we have started our works and were rolling scrap to cover our buildings. Fearing this statement may be copied by the trade journals we write you to say that the statements were incorrect. We will not use scrap sheets for covering our works. When our buildings were being erected we endeavored to purchase from works in operation pure puddled iron sheets, free from scrap, but were unable to do so. Failing in this we decided to make puddled iron sheets on our own mills for covering our buildings.

There are buildings in this valley and in Pittsburg covered with iron sheets that were put on from eighteen to thirty-two years ago, and are still in perfect condition; whereas steel sheets that were put on similar buildings four years ago are now riddled with holes.

These facts prompt us not only to use puddled iron for covering our own buildings, but to make a specialty of the manufacture of this material for the market.

Pittsburg Items.

The Uneeda Tool Company, recently incorporated with $5,000 capital stock, has completed the equipment of its machine shop at Martin's Ferry, O., and will put the plant in operation next week. An improved hand power punch will be made a specialty. The company is composed of J. B. Gordon, George McCue, W. L. Brown, George Reese, and Robert Jones.

The Rand Drill Company, of New York, has opened an office at 710, Park building, this city, in charge of F. C. Weber. Mr. Weber is an experienced engineer and has given special attention to the installation of complete central air power plants in machine shops, foundries, mines and quarries.

L. H. Gibson, 828, Park building, this city, reports an order from the Fort Pitt Malleable Iron Company, this city, for a seven-ton "Colliou" cupola and an order from the Colburn Tool Company for complete pattern shop equipment.

The Liberty Manufactuing Company, 5988 Center avenue, this city, contemplates extensive impovements to its plant in the near future. The company manufactures boiler tube cleaners and oil filters.

The Robinson Machine Company, Monongahela City, Pa., will build an addition to its plant for the manufacture of exhaust fans, upon which improvments have been made.

Industrial Notes.

The Transvaal Copper Mining Company was incorporated by Cincinnati capitalists January 10 at Charleston, West Va., for the purpose of mining copper, and other minerals, and building and operating transportation lines. The chief works will be in Mexico. The authorized capital stock is $100,000 and the incorporators are: Alfred Vogler, N. S. Rarch, L. Hauck, C. H. Mueller and J. R. Thomas.

The Pennsylania Steel Company, Steelton, Pa., is adding a frog and switch department to its plant. The frog shop will be 75 x 700 feet and the switch shop 80 x 400 feet. The loading shop will be 80 x 270 feet. A special work shop, 150 x 4[illegible] feet, will be built in which all the machine work will be done.

The Engineers' Troubles.

This week will determine in a practical way whether or not there is to be trouble this spring with the marine engineers. The Pittsburg Steamship Company has sixty-four steamers upon which chiefs and seconds are required, and in some instances third engineers. The full list has about been filed with men who have their names to contracts for the coming year. These men have been ordered to go on duty on their boats. The vesselmen say that if the engineers go to their boats it will be a virtual acceptance of the contracts by which the men will be bound to work through the year, regardless of any subsequent action of the Marine Engineers' Beneficial Association. It is acknowledged that this puts the men in a most trying situation, but it is further said that it is the only thing that they can do. The terms, for the chiefs especially, are so flattering that a consideration of personal welfare tends to lead the men to accept unconditionally. It implies not only the obtaining of an increase of from $100 to $150 a year in their pay, but also the acceptance of a bonus of the same amount. On the other hand, the acceptance of the contract by the Pittsburg company's engineers would be taken to mean that the engineers' organization, asa whole, could not stand out for any decisive action, as one of the biggest fleets would be left out of consideration. Whether the engineers, divided in that way, could succeed with any general movement against the vessel owners is a question that is seriously being considered. The order of the Pittsburg Steamship Company for the engineers to take their posts puts its men on trial as between loyalty to their company or to their organization. The acceptance of the contracts applies with equal force to the chiefs and seconds, although it is admitted that the seconds have no such cause for loyalty to the company in personal interest as have the chiefs, as they consider their pay inadequate at the rate offered by Mr. Hays.

In this connection it is recalled that the engineers have a code of ethics, which is incomprehensible to the vessel owners. It is that an engineer's first duty is to his union and tha this first allegiance is to the mandates of that organization. Any contract, therefore, which the engineers enter into upon their own volition is held by strict unionists as null when placed against an order of the union upon the question of contracts. The M. E. B. A. officers have not the slightest hesitancy in saying that the engineers may go to work under existing contacts with the Pittsburg Steamship Company, but that such contracts are subject to revision later on, when the national organization of engineers has had its say through the Washington conference, which is in session at Washington.

The Pittsburg Steamship Company is not willing to accept this interpretation of the contract signed by the men, nor are the vessel owners in general any more ready to enter contracts which are capable of such expansion on the part of the engineers themselves, while being binding, in a very narrow sense, upon the vessel owners. The whole question will be discussed thoroughly and it is expected that the men will be ready to act early this week. It is known that the Pittsburg Steamship Company will require that, if the men go to work at once, the contracts shall be binding throughout the year, regardless of any demand which the engineers in their Washington meeting shall make upon the vessel owners as a whole.

The vessel owners and the engineers are striving new to prevent any trouble this spring, yet it is admitted on both sides that affairs are trending toward an eruption. There will be a strong argument made before the national meeting in Washington by the lake contingent in favor of the adoption of some expediency that will make it possible to permit the engineers to accept the offer of the Pittsburg Steamship Company without embarrassing the association in dealing with other owners.

Isolated Plants Increasing.

The Pittsburg Construction & Engineering Company, 427 Diamond street, this city, has finished up the year in a satisfactory manner. This firm which has been in business less than a year has forged to the front as progressive and up to date engineers. In addition to its specialty, isolated plants for private residences, the company does a general engineering and contracting business; designing, furnishing, and installing complete light and power plants. During the past year, the company has contracted with the following companies for complete power installations:—Railway Spring & Manufacturing Company, Washington, Pa.; Pressed Steel Car Company, Joliet, Ill; Pennsylvania Car Wheel Company Allegheny; Fort Pitt Iron & Steel Company Pittsburg; and has closed the year's business by carrying off the order for the electrical equipment for the Standard Steel Car Company, Pittsburg, Pa. It is one of the few concerns in Western Pennsylvania to make a specialty of polyphase alternating current installations. The firm is composed of C. L. Wooldridge, S. B. Martin and W. W. Phillips.

The Norristown, Pa., Glass Company has increased its capitalization $30,000. With the increase extensive improvments will be made.

Remarkable Run of Silica Brick.

The Carnegie Steel Company is having remarkable success with its silica brick in the open-hearth plants. The runs made are the greatest in the history of the basic open-hearth furnace practice. Early last year four open-hearth furnaces at Homestead were lined with silica brick made by the Isaac Reese & Sons Company, of Pittsburg. The first furnace which had to be re-lined made a run of 368 heats, the second made 476 heats; third, 571 heats, and December 21, 1901, the last furnace was stopped after having made a run of 611 heats, the total number of heats made by the four furnaces being 2,026 heats. It is believed that this is the world's record.

At the Duquesne plant of the Carnegie Steel Company four similar furnaces made another remarkable run, special attention being paid to the life of the brick. Furnace number 51 made a run of 400 heats; furnace No. 52, 342 heats; No. 53, 409 heats; No. 54, 450 heats, a total of 1,601 heats for the four furnaces. This showing is not as good as that at Homestead, but under the conditions it is a remarkable run when it is noted that not one dollar's worth of repairs was made during the time.

When it is noted that the ordinary life of silica brick in basic open-hearth furnaces is from 250 to 275 heats, the runs made with the Reese brick are considered marvelous. Some furnace owners allege that this performance can be rivaled by repairing the exposed parts of the furnaces after every few heats, but the Carnegie Steel Company superintendents say that no repairs were made on the furnaces mentioned. Isaac Reese was the first maker of silica brick in the United States and for a long time had a monopoly of the business. There are many brick manufacturers engaged in making silica brick today and the price has been reduced from $50 a thousand to $18 and $20 per thousand. The performance of silica brick made in the United States has attracted attention of European steel makers and samples have been sent for to be tried across the ocean by German steel manufacturers.

Some Remarkable Candor.

The following letter, dated Pittsburg, January 11, appeared in a New York paper, January 16, credited to George Westinghouse:

"It may prove useful at this momennt to direct the attention of the press to certain features incident to the use of electricity for the operation of trains or cars. From the comments which have already been made in regard to the accident which is now uppermost in our minds, it seems to be assumed that such an accident would not in all probability have occured if the colliding trains had been propelled by electricity, and also that the absence of steam would have lessened the risk to the occupants of the telescoped cars.

As a matter of fact, with an electrically operated train the risk of accident will, judging by experience, be increased rather than diminished because of the presence of the heavy electrical machinery which it is proposed to attach to several cars of each train. Already there have been many serious collisions with loss of life between electric cars, while there have been numerous cases in New York and other places in which cars have been quickly destroyed by fire which has resulted from derangement of the electrical apparatus or circuits, and in some instances so quickly that passengers have had scarcely time to escape to the street.

It should be borne in mind that the electric energy required to operate a heavy train is sufficient to melt a considerable bar of iron or to start a dangerous fire if anything goes wrong upon a car of ordinary combustible construction, much more readily than the car stove, the use of which has been abolished by law. Therefore, if a collision was to occur between two electrically fitted trains, each having several combustible cars thereof fitted with electrical apparatus and carrying electrical circuits throughout, there could be an accident of so serious a character as to start an agitation having for its purpose the abolition of the use of electricity, or at least to compel the railway companies to abandon the use of combustible cars fitted with electric motors.

The destruction by fire of a car or train upo a street or upon a level is one thing, but suc an occurence upon an elevated railway or in tunnel can have consequences the contemplatio of which should lead to wise regulations govern ing the construction and use of electrically pro pelled trains and thereby insure to the publ the rapid development of electric traction. I Liverpool, during the past month, an electri train, while running in a short tunnel, was s fire by the electric current and destroyed wi considerable loss of life.

The Keystone Foundry Company, Spring Cit Pa., which was organized by Pottstown capita ists, with a capital stock of $60,000, has leas the new foundry of the Keystone Agricultu Works and will place it in operation this wee

The Niles Boiler Company, Niles, O., has ju finished erecting what is said to be the larg oil tank in the world at Marcus Hook, ne Philadelphia.

ɔoisson Company's Purchase.

The Joseph Soisson Fire Brick Company, ɹrough Manager W. F. Soisson, recently acquired ɪe entire holdings of the Kingston Silica Brick ompany, located at Kingston, Pa., which is ɒe of the best located properties for the manu- ɪcture of silica brick in Western Pennsylvania. The silica ledge which is located at the plant shows up a face of 40 feet by 1,000 feet long, being almost inexhaustible and the silica rock analysis 99 per cent pure silica. A vein of flin fire clay of good quality is also being worked a this plant which is found under the silica ledge.

This will give the Joseph Soisson Fire Brick Company, five brick plants with a capacity of 150,000 bricks per day, properly located with all modern machinery and raw material for the manufacture of silica and fire brick for coke ovens, glass houses, steel mills, pipe and wire mills, foundries. tin plate plants, and other purposes where silica, and clay brick are used.

Notes of the South.

Pig iron shipments from Alabama and Tennessee in December were 122,347 tons, of which 111 tons were exported; total cast iron pipe shipments were 8,252 tons, of which 187 tons were exported. Pig iron shipments from the Birmingham district alone were 61,463 tons, and cast iron pipe shipments were 3,994 tons. The total shipment of pig iron from Alabama and Tennessee for the year were 1,527,079 tons, and of cast iron pipe, 158,595 tons. The pig iron shipments for the year from the Birmingham district alone were 791,517 tons, and for cast iron pipe 78,134 tons. Steel shipments for the year amounted to 62,421 tons. The increase over last year's movements is generally large except in export, which shows a great falling off. The increase in pipe movements was one hundred per cent.

President E. O. Hopkins, of the Sloss-Sheffield Steel & Iron Company, states that enough rails have been sold for this year's delivery to keep all mills busy the entire year and that the same may be said of rolling stock for cars, engines, trucks, etc. The $12 No. 2 Southern basis for the iron market he holds is a reasonable one and predicts that it will maintain. He and other Southern furnacemen are opposed to further advances. He has three of the company's Birmingham furnaces at work after being practically rebuilt and the fourth furnace will go into operation April 1.

George F. Ross, vice-president of the Central Foundry Company, spent the week in the Alabama field, buying 2,000 acres of mineral land near the proposed blast furnace of the Central Coal & Iron Company, which is a concern within the Central Foundry Company. It is proposed to erect a soil pipe plant adjacent to the furnace and the company will also mine its own coal and ore. The plans are quite extensive. It is to this point that the Warrior Southern Railroad is being built.

The Southern Car & Foundry Company has secured an order from the Cincinnati, Hamilton, & Dayton Railroad for 1,800 box, flat and coal cars, the order calling for $1,250,000 worth of work. It was secured through President Spencer, of the Southern Railroad, and officials of the road giving the order. President J. M. Elliott states that the company has orders for four thousand cars all told, the Seaboard Air Line being a customer for 400 cars alone.

The rail mill of the Tennessee Coal, Iron & Railroad Company, at Ensley, is making one and a half and two-inch steel billets. It is gradually going into operation, department by department. The Louisville and Nashville Railroad has given orders for a large supply of steel rails for use in the Birmingham district and in Kentucky.

All the sub-contracts on the Warrior Southern Railroad have been let and the work of construction to the properties of the Central Coal & Iron Company has commenced. Judge Austill is pushing the proposition of the Mobile & West Alabama Railroad, which is to pass through Mobile, Demopolis and Tuskaloosa.

The Ensley Southern Railroad has been completed from Ensley to the Warrior river, a distance of eighteen miles, and is in operation to that point. It will be completed thence to Parrish junction on the Southern Railroad, ten miles further.

During December car movements in the territory of the Alabama Car Service Association were 41,820, against 38,646 the same month in 1900. Total movements in 1901 were 497,769 cars aaginst 464,277 cars during 1900.

Norman Morrison has bought out the Lucille Mining Company on the Ensley Southern.

The city of Cullman is putting in a waterworks plant.

Equipment for Standard Car Company.

The electrical equipment ordered last week by the Standard Steel Car Company indicates that it is the policy of the management of the new company to be thoroughly up to date. The Standard Steel Car Company has ordered from the Pittsburg Construction & Engineering Company the following electrical euipment:— two 375 k. w. 440 volt, three phase alternating current, engine type generators; 400 kilowatt, 220 volt, direct current, engine type generator; 300 kilowatt rotary transformer; 50 kilowatt engine type exciter; one $22\frac{1}{2}$ k. w. balancing set; and three 125 kilowatt auto-transformers. The above machines will be of Westinghouse manufacture.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb.
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....36c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1,00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lots of 100 pounds, $1 10 per lb.; special price on large lots

CINCINNATI SHAPERS.

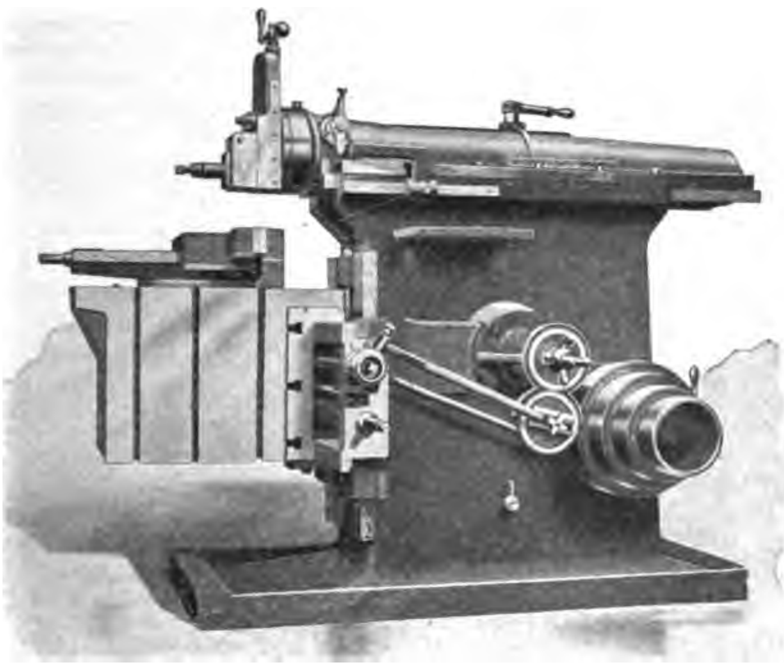
16-in. plain crank, 16, 20 and 24-in. back geared crank, 26 and 30-in. triple geared rack.

Our Plain Crank Shapers have four changes of speed; our Back Geared Crank, eight, and our Triple Geared Rack, being built on the four shaft planer principle, are actually triple geared, thus having three increases of power between the driving pulley and the ram. All are of great weight, having large areas of bearings, are accurate and powerful, and have openings in the column under the ram, for key seating.

The Cincinnati Shaper Company,

Sycamore and Webster Streets, Cincinnati, Ohio.

Good Shapers.



Nothing but Shapers.

24-in. Back Geared Crank Shaper, with power down feed as an extra.

BROWN & ZORTMAN MACHINERY COMPANY,

Exclusive Selling Agents in Western Pennsylvania, Eastern Ohio, West Virginia for the following Manufacturers:

THE LODGE & SHIPLEY MACHINE TOOL CO. CINCINNATI MACHINE TOOL CO.
CINCINNATI MILLING MACHINE CO. CINCINNATI SHAPER CO.,
BICKFORD DRILL AND TOOL CO., THE CINCINNATI PUNCH AND SHEAR CO.,

Manufacturers of Lathes, Upright Drills, Milling Machines, Cutter and Reamer Grinders, Crank, Geared and Traveling Head Shapers, Radial and Multiple Drills, Punches, Shears, Rolls and Special Machinery.

Write for Catalogues.

Corner of Wood and Water Streets, PITTSBURG, PA

West Virginia Notes.

Near Mt. Clare, a corps of surveyors has been engaged for the past few weeks making a survey of the Latstetter coal fields. The territory will be reached by a side track of one mile in length. Three mine openings will be made. It is the intention of the company to erect modern tipples and equip the mines with the best machinery.

H. G. Bowles, formerly manager of the Monongahela River railroad when the road was owned by Senator Johnson N. Camden, has been appointed secretary of the Wheeling board of trade, succeeding J. Francis Adams, who resigned to become auditor for the Reyman Brewing Company.

George K. McMechen & Son Company has leased the Windsor station canning plant and will equip it with machinery and operate it as an auxilary to the Wheeling canning establishment of the company this season At the same time contracts have been made for large supplies of the products of the valley.

The recently organized Consolidated Telephone Company operating in the interior of the state, is making many improvements, which will be continued. New wires are being strung between Clarksburg and Fairmont, Grafton and Fairmont, and Clarksburg and Grafton, all connecting with the home office at Clarksburg.

Salem, which was almost completely destroyed by fire a few weeks ago, slowly planning is to rebuild. The Merchants, & Producers' bank is having plans drawn for a $30,000 hotel; four stories, brick, fifty rooms, in the lower floor banking quarters and stores.

G. C. Jansen, T. G. Cupp, Frank Taylor and L. C. Driehorst, of Wheeling are representing the Wheeling Roofing & Cornice Company, at New Martinsville, preparing for the erection of a large plant. The company will move its Wheeling plant there.

O. G. Augir, of Grafton, has bought of C. G. Blatchley, of Philadelphia, the famous Blatchley pump works at Grafton. The plant will continue making pumps and will also devote much attention to a general lumber business.

W. A. Wilson & Son, builders' supplies manufacturers, will add two stories to their double business building, Wheeling, making five stories and adding very considerably to the concern's facilities.

The Williamstown Lumber Company, of Williamstown, W. Va., has been re-organized, with James McCormick president and general manager. The old stockholders assume the indebtedness up to date.

V. T. Clayton, and H. E. Travis, and other of Mannington have organized the Mannington Glass Works Company: authorized capital $40,000; paid in $5,400.

The Pearl Coal Mining Company, of which J. A. Clark, of Fairmont is president, has determined to develop 1,200 acres of land near Dingess, in Mingo county.

New directors of the West Virginia Short Line railroad are; President L. F. Loree, of the B. & O., Treasurer McNeal, of the B. & O., and John Bassel and T. M. Jackson, of Clarksburg.

The Short Line Coal Company, of Fairmont, capital $150,000, has been organized at Fairmont by James F. Cook, and others of that town.

Flaccus Brothers, of Wheeling, have bought property at New Philadelphia, O., and will establish a branch canning and preserving plant.

The Chandler Wire Fence Company, Trenton, N. J., is negotiating for a large manufacturing site near Wheeling.

Grading for the New Martinsville steel plant has begun. Local and Eastern capital will build the works.

The Ohio Valley Cut Glass Company, at Wheeling, has entered the trade.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 10
Galvanized, car lots, jobbers	2 55
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 50
Wire, plain, car lots, retailers	2 10
Galvanized, car lots, retailers	2 50
Wire, plain, less than car lots, retailers	2 42
Galvanized, less than car lots, retailers	2 56
Wire nails, car lots, jobbers	2 81
Wire nails, less than car lots, jobbers	2 31
Wire nails, car lots, retailers	2 10
Wire nails, less than car lots, retailers	2 2[illegible]
Cut nails, car lots	1 80
Cut nails, less than car lots, jobbers	1 80
Cut nails, car lots, retailers	1 95

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10	c
Copper, light bottoms	8	c
Heavy Composition	9 to 10½	c
Brass Turnings	6½	
Heavy Brass	7 to 7½	c
Light Brass	6.00	
Heavy Lead	3.75	
Tea Lead	3.50	
Zinc Scrap		$3.00
No. 1 Pewter	16	

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$ 4 5[illegible]
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs $4.75.

THE BUREAU OF PRINTING AND ENGRAVING.

BY WALDON FAWCETT.

FROM a scientfic standpoint there is no more interesting branch of the national government than the Bureau of Printing and Engraving at Washington, the institution where are engraved and printed all the United States currency, government bonds and other securities, postage and revenue stamps. In the degree of si ll involved and the precautions of one kind or another with which it is necessary to surround the work, the operations of this unique establishment have perhaps no counterpart on this side of the Atlantic.

Plate Printer.

Quite as important as anything that is to follow is the initial operation of designing, engraving and assembling a new plate. The designing of a new style bank note, gold or silver certificate, is left largely to the judgment of the chief of the engraving division. By utilizing bits of ornamental border work, geometrical lathe designs and blocks of lettering that are always kept in stock and inserting India ink sketches of portraits or vignettes he is enabled to prepare a preliminary specimen which gives a very fair idea of the appearance of the completed design.

After the design has been approved the preparation of various parts of the plate is assigned to the different expert engravers employed in the Bureau. The object of this plan of making each engraving a composite production is to secure the best

work of each engraver. Every employe of the engraving department is a master designer in some one line. One engraver is specially skillful in cutting vignettes, the talent of another lies in scroll work and a third is best adapted to artistic lettering. Accordingly each is assigned to that portion of the work in hand for which his ability and experience especially fit him. Indeed to such a length is this policy followed that it is doubtful if there is in the entire Bureau a single workman who is capable of bringing to completion unaided a plate of sufficient excellence to secure its acceptance.

After the various parts of a design have been prepared separately, either by means of a graver which produces a sharp black line or by the etching process in which the metal is bitten by acid, producing a more pleasing effect upon soft, decarbonized, steel dies or "bed pieces" the dies are removed to the hardening room where they are baked at white heat with a preparation of cyanide of potassium or corrosive sublimate in a specially designed furnace. They are next treated to a bath of oil from which they emerge hardened to a degree almost comparable to diamonds.

Perforating Machines.

The hardened die is placed in a transfer press whereby the exertion of a pressure of several tons the design which it bears is transferred to a soft steel roll. This roll in turn is subjected to a hardening process, identical in every respect with that employed for the original die. It should be explained at this juncture that in printing government securities of any kind the original roll or die is never utilized but instead the printed impressions are made by a replica. This is in effect a precautionary measure for whereas under the present system any number of replicas can be secured from the original die in case of accidents, no such simple solution of the difficulty would present itself were the printing done from the original plate. In that event an accident would necessitate the engraving of a new plate. Under such circumstances it would be extremely difficult to make the new plate a duplicate of the old in the minutest detail and even were this accomplished the notes or bonds printed from it would be counterfeits in the strict interpretation of the term.

Accordingly the steel roll after being hardened in the same manner as was the die upon which the design, or a part of it, was first engraved, makes a second trip to the transfer press and the graven impression which it bears is forced upon a soft steel plate. It was previously explained that each die and in turn each roll contained only a fragamentary portion of the design for complete bank-note or bond and thus one roll after another transfers its contents to the plate until at last the entire design is impressed or "assembled" as it is called upon the soft steel. Then this plate in turn goes to the potash furnace which as has been noted exerts a hardening influence and after it has been cooled by water which renders it even more durable than would the bath of oil it is ready for the printing press and perhaps 80,000 impressions may be struck off ere the printing surface will show the slightest sign of wear. It will be seen that this entire system is very similar to that employed in printing newspapers' books and periodicals from stereotype plates intead of from the individual type.

Printing Room.

A number of delicate and very intricate machines are employed in the engraving process but decidely the most wonderful of these are the two geometrical lathes which produce the web-like designs which appear more or less prominently on all denominations of currency and which constitute one of the most effective safeguards against counterfeits. There are comparatively few geometrical lathes in use in the entire world and those in the possession of the United States government are among the most complicated ever constructed. For their operation there is necessary not only the possession of the highest degree of mechanical skill but a complete and thorough knowledge of mathematics.

The paper used in printing currency and government securities is a tough fabric manufactured from the best grade of linen an silk and distinguished from other high class papers by lines or bandsof loose, colored, silk fibre which are so gauged in location

that two of them will appear in every note produced. All the paper used in this governmental work is obtained from a paper mill at Pittsfield, Mass., which is under the surveillance of government officers whose duty it is not to permit the production of any amount of the "distinctive" paper in excess of the requirements of the Bureau of Printing and Engraving. Of course the whole chemical and mechanical process involved is most carefully guarded.

The first step in the transit of the paper through the Bureau of Printing and Engraving is the wetting to which it is subjected to prevent the crumpling and scorching of the sheets when placed under the hot plates. This is accomplished by placing a package of from fifteen to twenty-five sheets between wet clothes of twilled muslin after which it is subjected for hours to a pressure of half a hundred pounds. During this latter interim the package is "shuffled," or the pieces of paper redistributed several different times in order that the dampening process may be thoroughly uniform in its effect.

All the printing is done in one large room containing 328 hand presses each of which requires for its manipulation the services of two operatives — one an expert plate printer and the other his feminine assistant whose duty it is to put in place the blank sheets of paper and remove the impressioned specimens. When not in use the printing plate rests above a gas jet which maintains the temperature of the metal and prevents the ink from dragging. The ink is applied by means of a hand roller. At least two printings — the stamping of the face and the reverse — are necessary in the case of every note and where the design is a particularly elaborate, one, three or even four impressions are required. The size of the sheets of paper used enables the simultaneous printing of four notes by each press and inasmuch as the operatives receive remuneration proportionate to the amount of work performed they naturally become very dextrous.

Engraving.

After remaining for a time in the drying room where a temperature of 150 degrees is maintained each freshly-printed note is subjected to the scrutiny of an expert examiner whose duty it is to remove and cancel any defective specimen of printing which may come under her inspection. To restore the sizing which has virtually disappeared from the paper during the fifty-two handlings and countings to which it has been subjected during its passage through the Bureau the sheets of currency after passing inspection are fed into a machine which treats them to a bath of alum, glue and other ingredients and discharges them practically dry. Enclosed by oiled card board each sheet then undergoes five thousand pounds hydraulic pressure which imparts the distinctive crispness.

One of the final operations of currency manufacture is the affixing of series numbers, an operation which is performed by a machine which was invested at the Bureau which sets its own type and automatically numbers consecutively from 1 to 1,000,000,000 imprinting upon two sides of the note. About two million dollars in currency is burned daily and there is kept in the vaults of the Bureau a surplus stock of from four hundred to six hundred million dollars. Postage stamps are printed in sheets of four hundred. The gumming is done by an electrical machine and each sheet is fed twice through a perforating machine. The output of postage and revenue stamps is seldom less than ten millions daily and as high as thirty millions have been turned out in a single day. The Bureau of Printing and Engraving gives employment to about 1,600 persons.

Open Hearth Furnace With Compartments.

JOHN L SMITH and Robert Bedford, Jr., of Egglescliffe, England, have patented in this country, an open-hearth steel process, and have assigned a one-third interest to the South Durham Steel & Iron Company, limited, of Stockton-on-Tees, England.

They employ an ordinary type of open-hearth furnace, adapted for the improved process by being provided with one or more dams, so arranged that the hearth is divided into two or more compartments, up to any required height, and above which the compartments merge into one large chamber, which is common to all, whereby a charge of steel can be withdrawn from one or more compartments from time to time, while a bath of molten purified steel is left in one or more of the other compartments, to remain on the furnace-bottom after tapping.

It is a well known advantage to retain on the bottom of an open hearth furnace a bath or pool of steel left over from previous tappings, to which fresh charges of molten metal in an unpurified state—such as would be drawn from a blast-furnace, cupola, converter, or other suitable source of supply—can be poured from time to time without injury to the furnace-bottom; but the difficulty has been to effect this result in a practical manner, and the only methods hitherto devised which have been commercially used have been by tilting the furnace bodily or by other awkward means until a desired quantity of steel has run out. By such processes, if solid material is also to be used it must be charged into the bath of molten steel, which is cooled thereby and the process correspondingly retarded.

In this invention they not only charge the large compartment with unpurified molten metal, which is received into a bath of molten steel, but they also charge into the empty or practically empty compartment any desired quantity of solid materials—such as pig-iron, scrap metal, or other suitable material—where such charge is exposed to the heat of the furnace and raised to a suitable temperature before coming into contact with the molten steel which is pooled in the larger compartment, it being understood that "unpurified" metal refers to such metal as could run from a blast-furnace, cupola, or other source in a conditon requiring further treatment for conversion into steel ~~of the grade~~ to be produced by the process in question.

The process is a continuous one and the steel is never drawn from the larger compartment until it is desired to shut down the furnace; but steel is from time to time drawn from the smaller compartment, this drawing off usually emptying the smaller compartment completely.

In practice, the furnace is arranged with two or more compartments, one of which is preferably larger than the other. This larger compartment is charged with a bath of molten steel left over from the previous tap, while the steel from the smaller compartment is run completely off. The empty part of the furnace hearth, the smaller compartment, is then charged with a quantity of ore or other oxids of iron, which protects the hearth from the overflow of molten metal from the large compartment. As soon as the scrap has been brought up to a swetting heat, molten metal from the blast furnace converter or the like is run into that compartment containing the molten steel from the previous charge, the whole mixing together into the other compartment, coming into contact with the oxids which are now at the best possible heat for making a chemical union. This submersion of the solid material causes a boil after which the charge in both compartments is worked in the ordinary way by fresh additions of iron ore and lime.

EXPERIENCES OF THE "OUTSIDE MAN."

BY ALBERT STRITMATTER.

AMONG the various classes of mechanics there is none with a more varied experience than the erector or "outside man." He is sent to all kinds of jobs, from putting up large plants to locating some trivial defect or difficulty. He must, in order to be successful, combine the qualities of patience, insight, energy and ability. He must be patient for he will come into contact with men who have become irritated from having had trouble with the machine in question and with men whose ideas as to the installation of certain machines oppose his own best judgement. He will also have to engage men to help him, or work with men who are furnished him who are in no way competent and who will try his patience as no man working in a shop regularly would be permitted to. He must have the quality of insight or discernment in the characters of the men he has to deal with, for frequently they will demand work of him which he is not supposed to perform and for which they are not paying. Therefore he must be able to look into their personalities and discern the best methods in which to deal with them. He must be energetic, for frequently he has to work all day and a part of the night in order to get through with one job of work and away to a distant town where another one is waiting for him. In fact, most of his traveling must be done at night. He must know the details of the construction and assembling of the machines on which he is working, for he will have to be able to locate and remedy difficulties connected with every part of the machines. He of course meets with all classes and conditions of men and has many experiences, both humorous and serious, and, if he is the jolly, good fellow that many of them are, he never wearies of telling his experiences. One day several years ago a man of this class came into the office with his eyes ad face bandaged up. His story was as follows:

"You know I was sent down to Cincinnati to look into some trouble with that 40 h. p. gas engine. I looked the engine over and could not find anything wrong but I thought it was probably in the battery or in the insulation of the electrodes. So I took that small plug out of the end of the cylinder and was just going to peep through and see if there was a spark inside when I worked the igniter. I told a fellow near there to see if the gas was shut off and he said it was. So I tripped off the igniter and there was an explosion and of course it blew a flame out right into my eyes. In some way or other the gas wasn't turned off or there was some gas left in the cylinder. I was in the hospital for a week while I couldn't see a thing. It's a wonder that I've got any eyes left at all. But I found out that that engine got a good spark anyway."

One day we received a letter from a concern where one of our men had been working and they stated that our man had been almost drowned the night before. That was all the information they gave and so when Lee got back he was plied with questions. It seemed that the engine had been installed at a pleasure resort where it was used to run a dynamo for lighting the casino and the exhaust pipe was run out of the building to an artificial lake where it was muffled. One night the engine stopped in the middle of a dance and, as the owner of the place had written, when asking that a man be sent, the "boys" took advantage of the darkness to do considerable hugging. Lee was sent to see what the trouble was and had been running the engine when he went out to look at the muffler. He worked around this for quite a while and as the engine had not been igniting well there was considerable gas around which finally overcame him and he fell into the water all of a sudden. The shock of the cold water brought him to, however, and he managed to get out none the worse for his ducking.

One day, however, Lee came in from a trip with both his hands tied up and rendered the following account of his trip; "When I left here I first went up to a town in Wisconsin to see an engine the agent had reported had given trouble. When I got there I found the engine all right and the people satisfied, although it had

stopped on them once or twice. They were nice people, Holland 'Dutchers' and I thought I'd have a nice time, so I decided to stay a day or two and see if the engine gave any trouble. It went along all right so I had nothing to do but visit with them and I had a nice time. The old man had six sons and five of them left to join the Boers in South Africa.

"Well, then I went to another place just to look at a 20 h. p. engine. They had it running one of those "three-high" feed mills and had it set so close to the mill that the pulley centers were not over four feet apart. Of course the belt was stretched tighter than a drum head and there was such a pull on the crank shaft that the main bearings were worn 1-16 inch within a month after they had it.

"From there I went back to our agent's place and he sent me to a place where they had difficulty in starting the engine. They were those kind of people who, when buying an engine of 15 h. p. or larger, think they must have a pneumatic self starter. Well with some of the makes you need them out not with ours, except the very large ones. So I showed them how to start the engine without the starter and then they wanted me to take down the starter. As they were using the engine to run a flour mill and did not want to shut down then, I told them to go ahead. I'd disconnect the starter without stopping the engine. I got all ready to disconnect the pipe from the engine cylinder where it lets the compressed air in. I had a plug in my hand ready to stop the hole up as soon as I unscrewed the pipe, and I stepped to the battery switch to cut out the current for a few revolutions till I got that plug in. Well, in some way that switch must have gotten thrown back into contact again, for just as I was putting in the plug the engine fired and blew out through the hole and burned both my hands. Quick as a flash I shoved both my hands into a bucket of oil that happened to be standing there. They wrapped up my hands and got me to a doctor, who dressed my hands. He wrapped them up so I couldn't use them even to get my clothes on and off, so of course I had to come home as I could'nt do any more work. On the way back I went to our agent's place again and was getting ready to go home, when in came a man from a convent 13 miles out in the country. He said their engine would not govern and he wanted me to go and see it. It was colder than blazes and my hands were tied up, so I dreaded to make that long ride through the country. However, I finally agreed to go down and do what I could, so we drove out. After we got there and went in he started up the engine and she ran off and kept going faster and faster all the time. Then all of a sudden, when I thought she would surely break something, she started to go slower and slower. I couldn't use my hands so I just put my arm up again the governor balls and they stopped from just that little pressure. I told the fellow to stop the engine and when he did so I said, 'Get a monkey wrench and tighten up that set screw on the governor gear.' He did it and then asked me what next. I told him that was all and to start up the engine. He looked dubious and disgusted with me, but did as I told him and was very much surprised when she started off all right. That was all in the world that was the matter. I got him to drive me back to town that evening and got the night train home."

Another man came in from a small town in a central state, where he had been sent to see why an engine used so much fuel. On coming into the office I asked him what the trouble had been and he said something about "monkey business." On pressing him further he said:

"When I got there I found the engine installed in a sanitarium and running electric lights. They claimed that she was using too much gasoline, that it used 12 gallons in four hours and as they had only an 8 h. p. engine, that consumption was at least three times too much even if on full load. I didn't see how they could push so much gasoline through it and so I looked at the gasoline tank and pipes to discover a leak but could not find any. After looking around for a while I finally found the difficulty. You know in our feed box there is a hollow overflow plug which regulates the amount of the charge by the height of the hole or valve in it. Well they had soldered about half an inch extension on to this plug and were forcing three times as much fuel through the engine as it ought to have had. I cut this piece off and cleaned up

the engine a little. They thought it would not make any difference, so I made a test and it ran on less than a third the amount they had been using."

One of these "experts,' as they are sometimes called, worked for a firm who built flour mill machinery. They had sold a purifier to a miller who reported that it would not work at all. The man was sent and on his arrival it took him about two seconds to see what the trouble was. In spite of the fact that an arrow was painted on the side of the machine to indicate the direction in which it should run, the miller was operating it in the opposite direction. There are, indeed, few machines of any kind that will give as good results running backwards as they will forwards.

One day we received a telegram for a man and as we were short of regular men for outside work, we sent a young fellow who had never before been out on the road. He was given a supply of expense money and on his return made a report of the trip, then reached his hand into his pocket and pulled out a lot of change, laid it on the desk and started for the shop, He was called back and asked to show his expense account and explain how he had spent his money.

"I don't know," said he, "you know how much you gave me and that's what I've got left."

"Didn't you keep a record of what you spent your money for?" the bookkeeper asked.

"No," he replied, "I just spent what I had to and gave you the rest of it. You know what you gave me so you can tell what I spent."

He was given a course of instruction in keeping expense accounts and as he went out after that he was followed with the caution, "Don't forget to keep an account of your money, Iky."

In the preface to a German textbook which is used in some of our largest colleges, the author writes as follows;

"A certain German pedagogue placed on the title page of a schoolbook that he had written, the motto 'Man kann sich seiner Schuler nie zu dumm vorstellen.' (I is never possible to over-estimate the stupidity of your pupils".

It was the failure to remember this, as applied to the purchasers of machinery, which led to a novel experience of one of our outside men, who related the following story;

"I was sent to erect a large sized machine and when I arrived at the place they told me the foundation had been prepared for it but they did not see very well how I was going to get it up there. I did not quite understand what they meant, but thought the easiest thing would be to take a look at it. So they took me to the cellar where the machine was to be set and there she was on the floor and right beside her was the foundation built right up from the floor. They hadn't dug a pit and started the foundation below the floor level to bring the top of it on a level with the floor, and the result was that the top of the foundation was within a foot and a half of the ceiling. It all came about by our foundation plans not being marked with the top of it 'Floor Level.' How in the world they expected to do anything that way I don't know. Well, it made me sick to look at that nice foundation there and when I told them he'd have to tear it down and do it over again, it pretty nearly made them sick too. Of all the fool jobs Iv'e run up against, that certainly was the worst."

Refining and Regaining Tin.

FROM Denmark comes a new process for regaining metallic tin in a pure state from its alloys—such as Britannia metal, and waste or scrap of all sorts, also for the refining of raw tin. The invention is by Paul Bergsoe, residing in penhagen, and was devised for continuous operation upon a large scale. It comprises the steps of subjecting a tin-bearing material to the action of a stannic-salt solution, subjecting the resulting stannous-salt solution in the presence of a cathhode and an indifferent anode to electrolysis, and thereafter continuously subjecting the solution alternately to contact with a tin-bearing material and to electrolyis in the presence of a cathode and an indifferent anode.

Before subjecting the raw tin-bearing material to the process it is preferable to clean

or otherwise preliminarily prepare the same. Tinned sheet-iron waste may, however, be treated directly without any previous cleaning, comminution, or sorting. Tin alloys have to be first rendered in suitable condition for solution by granulation or by casting the same into thin sheets, the object being to expose a large surface to the action of the solvent fluid in carrying on the process.

The process consists, essentially, of two stages—first, the step of dissolving tin from a material bearing the same, whereby the tin of a suitable stannic combination contained in the solvent liquid is caused to change its form or valency from four to two; in other words, from a travalent to a divalent state—so that the solution becomes stannous in character, and, secondly, an electrolytical disposition step, whereby a quantity of the tin from the stannous solution formed in the first step is removed in a pure state and simultaneously an equivalent quantity of tin in combination in the liquid is transformed from a divalent to trivalent condition, whereby the solvent liquid is re-formed.

The solvent liquid may consist of an aqueous solution of a stannic salt—for instance, of stannic chlorid or of any other similarly-acting stannic compound. Indifferent salts for increasing the conductive capacity of the liquid may be added.

The dissolving step of the process and the electrolytical step of the same may be carried out in the same vessel; but in practice it is preferable to allow them to take place simultaneously in separate vessels, which communicate, however, with each other, so that the liquid can circulate between them. When the stannous solution is allowed to flow continuously from the solution vessel to the electrolytic cells and the stannic solution from the latter back to the solution vessel, and so on, an uninterrupted transport of tin from the raw material in the solution vessel to the cathodes in the electrolytic cells is obtained without the raw material itself forming an electrode.

The following formulae, wherein R indicates the anion—such, for example, as chlorin—indicate the reactions of the process:

$$SnXSnR_4=SnR_2XSnR_2$$
$$SnR_2XSnR_2=SnR_4XSn.$$

It will be seen that this process differs from the ordinary electroysis, wherein the anion either combines direct with the metal of the anode or evolves into a free gaseous form, or, lastly, gives rise to a secondary evolution of oxygen.

It is essential to the carrying on of the improved process that an anode of inert or different material, such as carbon, can be used. Plates of tin, iron, or the like may be employed as cathodes. By the electrolytical step there is directly formed a tin compound of tetravalent form That the anionis not first evolved in aeriform condition and later on combines with the neighboring tin ions will be seen from the circumstances that the electrolysis takes place at a considerably lower potention than if gas had been evolved. It is a necessary condition in order to carry on the process in accordance with the above-cited formulae that a current of low potential—i. e., about 1.5 to 1.7 volts—and an electrolyte containing a sufficient quantity of divalent tin, or, in other words, not too concentrated as regards its contents of tetravalent tin, be employed. A sufficient quantity of tin must always be contained in the solution vessel for absorption by the solvent fluid, so that the same can always take up without interruption any quantity demanded to replace that which has been deposited. The process will remain continuous while this condition exists. When the white color of the tin upon the tin scrap, or other material, disappears, it is an indication that an additional supply of material should be put into the vessel. The tin is deposited on the cathodes in compact metallic form. The raw material does not itself enter into the circuit or serve as an anode. Acid-baths can be used without incurring the danger of introducing foreign metals to the tin deposited on the cathodes. The tin obtained by this process, in contradistinction to spongy tin, can be melted down without loss. The tin is perfectly pure, furthermore, because any foreign metals, such as zinc, which may have been dissolved during the dissolving of the raw material are not deposited by the electrolysis and not even a trace of them is found in the tin.

The stannic compounds—such, for instance, as stannic chlorid (H_2SnCl_6)—which were heretofore not employed in a process of this kind are powerful reagents, acting in the nature of oxidizing-acids, and their employment renders the process an entirely practical, continuous, and economical one.

TESTS AND CONSTITUTION OF PORTLAND CEMENT.

BY A. D. ELBERS.

THE Portland cement industry of this country is developing so rapidly that it will soon be absolutely independent of the importation of a material which—if for no other reason—should be produced at home on account of the importance that attaches to the permanency of the work for which it is applied; it being well understood that manufacturers are apt to give their closest attention to the requirements of the home market, and that the latter—as regards the quality of a cement—are more or less dependent on local climatic conditions. As an example, it may be stated that in some European countries, where it takes two days for washed clothes to dry, and for bread to get stale, because the moisture of the atmosphere amounts in the average to eighty per cent of complete saturation, some sorts of cement give satisfaction in open air work that would not do half so well in this country, where the average moisture amounts only to about seventy per cent. It is, therefore, but natural that the conventional methods of judging the fitness of a cement—which were copied from those in vogue abroad with perfect propriety so long as the imported was the leading article—should be subjected to closer scrutiny, with the object of raising the standard of requirement in every direction in which it can be done without imposing unnecessary hardships on the home manufacturer.

As to the physical tests that have been adopted by the American engineering societies and the Boards of United States Engineers, no fault can be found with them except, perhaps, in a few minor details. They may, possibly, be simplified in the measure in which increasing knowledge of the chemistry of cement enables us to foretell its properties from its analysis, but it is evident that they can never be dispensed with entirely because every fresh Portland cement contains its three chief constituents in unchanged relative proportions whether it has been properly calcined, overburned, or underburned, whereas its quality depends largely on the results of the burning.

In making these physical tests it is, of course, desirable to initiate as nearly as possible the conditions that obtain in actual practice; and with this object in view it has been agreed upon to use only sand that passes through a sieve of twenty meshes to the linear inch, and that is retained in thirty. This is all very well so far as it goes, but as the cement mortar is pressed into the briquette molds with a much smaller quantity of water than it receives in actual practice, the conditions are not similar anyway. Besides, the larger the sand-particles, the more irregular they are apt to be in shape, viz: of greater diameter in one direction than in another or rather oblong; and the more irregular they are in shape, the more likely it is that they may arrange themsevles in different ways when the mortar is pressed into the molds, so that the cross-section at the line of fracture may represent a mixture for 2½:1, or 3½:1;, instead of 3:1, which probably accounts for the results of sand-tests made at different laboratories with cement-samples from the same barrel show frequently such wide discrepancies. Smaller sand will, of course, give more uniform results. For the same reason it seems advisable to make the neat driquettes from sifted cement, inasmuch as the unsifted will give comparatively poor results in case an excessive proportion of the coarse stuff should accidentlly become located in the narrowest section of the mold, near the line of fracture.

As regards resistence to tensile and compressive strains, the seven days, briquette tests call for results which, if realized in practice, would give from five-fold to ten-fold security even if the structures for which the cement is to be used were to be five hundred feet high; twenty-eight day tests are, therefore, chiefly for the purpose of ascertaining whether a substantial increase of strength has set in in the intervening time, because such an increase gives better promise of the permanency of the endurance that is expected from the work. If competent enigneers complain, nevertheless,

of very unpleasant experiences of the way in which cements that have been well tested and carefully laid behave after three or four months, or even after years of apparent reliability then these shortcomings must be attributed to ingredients of composition whose injurious influence has been thus far either overlooked or underestimated. That this should be so, need not surprise, considering that many conflicting theories are still entertained in regard to the molecular combinations that may occur during the burning of the cement-composition, and in regard to the molecular re-arrangements that take place in the finished cement after it has been mixed with water; for without more precise knowledge on that subjcet, quantitative analysis of the finished cement cannot be revealed to us those defects which the physical tests of the gauged mass fail to disclose. The molecular theories that have to be taken into account in order to arrive at a better understanding of the case may be outlined as follows:

Beginning with that stage of the burning when all of the combined water and carbonic acid gas have been driven out, the cement composition consists then in the main of free lime and dehydrated silicate of alumina both intermixed with free silica, to a smaller extent with ferric oxide, and with still smaller quantities of all alkalies and magnetic oxide, the latter being derived from ferrous-carbonate. As the two last mentioned ingredients are the most energetic bases of the mass, they begin to unite with free silica before the burning has become sufficiently intense to force the lime into combination, and as their fritting action compacts the mass, it also speeds the subsequent reactions by bringing all the other ingredients into closer contact.

Taking the average composition of good Portland cement as a standard for the suitable molecular proportions of the principal ingredients—without regard to the amount of silica that has to be set apart for combination with the minor ingredients before mentioned—the mass has to contain them in about the proportion of twenty molecules of lime to two of sesquioxide of alumina and iron, and seven of silica. When a composition of such basicity becomes completely melted, it falls apart in cooling; and when it has only been fritted hard or reduced to a sintered mass—as is the case with good cement—it decomposes partly when it is mixed with water.

Returning now to the consideration of the further combinations that are apt to take place during the burning, the writer is of the opinion that the composition of natural compound silicates of singulo or mono-silicate constitution gives the only clue to their succession, inasmuch as the preponderance of the lime precludes the formation of more acid compounds in cement. There are, of course, various ways of revolving the line of succession, among which the following seems about the most direct for the comprehensive illustration of the reactions that can take place. To start with, we have the dehydrated clay-substance, which contains one molecule of alumina to two of silica. In combining with one molecule of lime the composition of this simple silicate become changed to that of compound singulo-silicate of lime and alumina of the constitution of anorthite; in taking up two additional molecules of lime and one of silica, the anorthite—composition becomes changed to that of garnet; and when two molecules of garnet take up two additional molecules of lime and one of silica—or one molecule of singulo or di-basic silicate of lime—the resulting compound has then the constitution of idocrase, which crystalilizes with one molecule of water because its chemism is not satisfied (which means that the bond between the constituent simple silicates is not complete) when more than three molecules of singulo-silicate of lime are combined with one molecule of singulo-silicate of alumina. The idocrase composition may therefore be considered as consisting of two molecules of garnet, linked to one molecule of di-basic hydro-silicate of lime.

After all the silica, alumina and ferric oxide of the cement composition have fritted with lime in the proportion of the idocrase composition, there remain still twelve molecules of free lime to one of the silicate-compounds, which quantity can only be brought into combination by such intense burning that the alumina and ferric oxide of the silicate compounds are forced to assume the character of acid constituents. This change does not, however, involve an actual split—or the breaking up—of the idocrase composition, but simply increases its combining energy. When ivory balls are set up in a row, and the ball at one end receives a concussion, the ball at the other end is set in motion and goes off; conversely the intense heat imparts to the sesquiox-

ides of the fritted silicate-compounds the impulse to attract more basic molecules and to hold them fast. But as the sesquioxides have a tendency to flop over from one impulse to another (a sort of a mugwump disposition,) the energy imparted to them by heat does not hold out when the compounds thus formed are brought in contact with water. The lime, attracted by them, becomes then gradually released in the proportion of three molecules to one of alumina and ferric oxide, and the remainder of the composition may then be considered as a mixture of compound subsilicates with an oxygen ratio of 3:3. Such compounds are readily attacked by water containing lime in solution and then yield—in the case of cement—calcium hydrate, silica and alumina in the gelatinous state, ferric hydrate and minor quantities of silicate of soda, etc.

Accordingly to the old theory—which was transmitted to us from the time when techno-chemical literature was still in the romantic stage as it were—the final outcome of the burning is in the main a mixture of silicates, aluminates and ferrates, the constituents of which fall apart in gauging and recombine thereafter in an inexplicable manner. The adherents of this theory may reply that it seems immaterial whether the ideal composition is considered as a mixture holding two molecules of tricalcic aluminate and ferrate to seven molcules of di-calccisilicate, or as a subsilicate-mixture a definite amount of combined holding lime in excess, as long as the quantitive proportions of the constituents, as expressed by either formula remain the same. But under the old theory there is no way of following out the progress of the reactions that take place in gauging and that lead to the setting and to the subsequent hardening, with any degree of accuracy, and so long as that cannot be done the saying, attributed to LeChatelier, that the only way to determine whether a cement is sound is to wait half a century to see how the the work stands, is about correct.

It remains now to be shown what support the new theory will receive by circumstantial evidence. To start with, it may be supposed that in gauging. the finished cement, it combines with as much of water as the idocrase composition requires for crystallizing (i. e. one molecule.) Assuming for the purpose of simpler illustration that alumina is the only sesquioxide present, and allowing five per cent for alkalies and accidental constituents, the gauged mass would then analyze as follows: 60.5 lime; 22.7 silica; 11 alumina; 4.8 sundries; and one per cent of water. Total=100. Assuming further that the lime in excess of the subsilicate composition hydrates gradually—which it can do without "blowing" because it is well known that firmly confined free lime hydrates and even carbonates without expanding—the composition will take up six molecules of water in addition to the one which caused the setting and thereafter the quantitive proportions of the constituents will be:

57.1 lime; 21.4 silica; 10.5 alumina; 4.7 sundries and 6.4 per cent water=100.

The respective contents of combined water correspond very nearly with those which a well known authority has found to obtain in Portland cement dried in the one case immediately after gauging, and in the other, after the set mass had been seven days in water, viz: 0.99 per cent and 6.58 per cent which tends to corroborate the correctness of the theory therein announced.

But while the absorption of water subsequent to the setting is progressing, the partial decomposition of the subsilicates has already begun, and the gradual hardening of the mass that then sets in, is to be ascribed to the formation of new hydrosilicates out of the dissolved constituents. As silica and alumina in the gelatinous state do not dissolve out to any extent unless the contents of alkalies are excessive, whereas the greater portion of the hydrated lime is apt to be gradually carried away under water, the newly formed compounds (i. e. hydro silicates) must contain less of lime, and more of silica, alumina and combined water than the old composition; and such compounds become very hard and resist the attack of carbonic acid, if not of much stronger corrosives. The plea, that these newly formed compounds may become decomposed by the carbonic acid gas of the air when the set cement is not kept under water, falls to the ground because the carbon di-oxide will always attack by preference the hydrated lime so long as there is any; and according to the new theory the cement seven days old may contain about twenty per cent of that. Moreover, the resistance to compressive strains is, according to the statements of other authorities,

about the same after 90 days whether the set cement has hardened in the open air, under water, or alternately in both ways; which shows that in the one case more of the hydrated lime becomes carbonated, whereas, in the other, the steady formation of hydrosilicates is the chief cause of induration.

After thus eliminating to a great extent the elements of uncertain or inexplicable combinations from the discussion of the durability of cement-work, it will become apparent that indurated Portland cement remains durable in the measure in which the unchanged compounds of its set mass become enveloped by the more enduring compounds of subsequent formation, that the latter are the more enduring the less they become mixed up with soluble remnants of the decomposed portion of the set mass, alkalies and sulphides, or with soluble admixtures (gypsum) and ballast, ferric hydrate and that the whole mass is liable to break up when the adhesion of the respective constituent parts—i. e., of the original, and of the subsequently formed compounds—becomes weakened by unlooked for reactions.

This latter contingency is what thoughtful engineers are most afraid of. Some of them suspect that the admixed gypsum may mask or retard the effect of overliming for several months, and that such cement will expand after the gypsum has dissolved out. This does not seem rational because gypsum, though retarding the setting, does not prevent the pats or cakes from "blowing" within a few days, or even hours, after they have set. Others are rather dubious about magnesia, because it expands to a certain extent in crystallizing after hydrating. This phenomenon should not create apprehension because it is well known that magnesia cement, made of dolomite that has been calcined in such manner as to leave the carbonate of lime unchanged. shows its setting properties to this very crystallization, inasmuch as its mass would not become compact without it. It is therefore not likely that magnesia is an obnoxious constituent as far as the behavior of the applied cement is concerned though there may be reasons from a manufacturer's point of view to avoid a too large percentage of it. Possibly magnesium carbonate and gypsum may, under certain conditions, have a bad effect on each other, inasmuch as it is known that finely pulverized dolomite, stirred or shaken in hot water that is saturated with calcium sulphate, yields mangesium sulphate, which is a very soluble salt. But whether a similar reaction can take place in cement is a matter for analytical chemists to determine. As to the boiling tests of cement that has just set, it seems plain that even the best is apt to break up on account of the accelerated dissolution of silicates of the alkalies.

It has been claimed by some prominent investigators that ferric oxide combines with silica during the burning by parting with one molecule of its oxygen. This may be so or not. But what we know for certain is, that the magnetic oxide, which is derived from the ferrous carbonate of the raw materials, does change more readily to ferrous oxide in combining with silicate and that ferrous silicates become decomposed—or superficially corroded—by the alternate action of the atmosphere, and of hard water. It seems, therefore, likely that the bond between the original silicates and the subsequently formed hydrosilicates of the set cement may gradually become loosened in the measure in which ferrous silicate is contained in either mass. In judging of the quality of a cement from its analysis it might therefore, be of advantage to have an exact determination of the contents of ferrous oxide. As to ferric-oxide, that is regarded by many authorities not only as an unavoidable but also as an essential constituent, inasmuch as it is well known that a moisture of ferric oxide, alumina and alkalies frits at a lower temperature with silica than alumina and alkalies in corresponding molecular properties without the ferric oxide, but as the latter becomes in the end nothing better than ballast if not doing mischief by changing of ferrous oxide during the burning—the smaller its relative proportion as compared with that of alumina the safer it may be.

The writes does not claim that these statements give the complete solution of the question of the ulterior deterioration of Portland cement work, but only hopes that his suggestions in regard thereto may help to bring that about.

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A Popular Error About Natural Gas.

IT has become such a common cry among consumers of natural gas that the company from which they secure their supply is pumping air into their main, when the gas pressure is low that some attention should be given the subject. And the most peculiar feature of this charge is that men of ordinary common sense and many with a rudimentary education in chemistry make these charges. If firms supplying natural gas were to pump air into their mains they would within 24 hours asphyxiate or blow up seven-eights of their consumers and the consequent damage suits would ruin such a concern beyond all hope of recovery.

The simplest illustration to show that air cannot be forced through a gas main and made to light, even for an instant, is that of a new installation in a building. After the plumber or pipe fitter completes his work and the gas pressure is permitted to enter the pipes any attempt at lighting a burner will be frustrated. A pressure of air will be forced from the pipe sometimes strong enough to blow out a lighted match but it will not burn. This is because the pipes are filled with air, nitrogen, oxygen, carbon di-oxide and a certain amount of vapor. This will not burn although it is necessary to aid combustion of gas and other inflammable substances. What results in a new pipe or where air fills a pipe would also result if a pressure of air was forced into a gas main to force the gas more quickly through the mains or to enrich the gas or even to make a gas meter work more rapidly as the charge is frequently made.

It has been maintained that the air pressure forced into the gas main assimilates with the gas and impoverishes it. If this is true why did not the air in the gas pipe left there after a plumber or pipe fitter has completed his work assimilate with the gas? That it does not every one has obsevrved who has ever tired to light a burner at the end of a newly laid pipe.

Many companies supplying natural gas maintain large pumping stations along their mains between the gas wells and the point of consumption. These are located in isolated places usually, and the public merely learns that such pumping stations are maintained, but few attempts are made to investigate the working of these pumps and why they are necessary. When natural gas was first made use of as a fuel it was wasted in every possible manner. Within a few years the pressure from nature's storage tanks began to diminish. There was still plenty of gas within the bowels of the earth but it could not issue forth in sufficient volume to supply the demand. What more natural than to have pumps erected and pump it out of the earth to the consumers? This is exactly what is being done.

Some cities have rivers passing through their confines, others have lakes nearby from which the water supply is secured. The water does not run into the homes of citizens. It is pumped into reservoirs or stand pipes, or it is pumped direct in some places to the consumer. Do the pumps supply air instead of water? Not any more than the natural amount that mingles with the water in its passage. The pumping of natural gas is exactly the same proposition. The only air that is mixed with the gas is that which comes from the gas chambers below and every one who has given the subject any attention knows that gas will ascend above air because it is lighter volume for volume.

If air was pumped into gas mains the consumer would have a gust of air, then a small supply of gas between the strokes of pumping. It would require a continuous igniter at the place of burning to start a blaze every time the rush of air extinguished the blaze. The truth is that some gas is so poor that it will not develop proper

heat. In most cases, however, the ignorance of the plumber and the consumer is to blame. They do not know how to regulate the air pressure through the mixer, believing that one mixer will do for all sorts of gas and pressure. A special mixer is necessary for each mixture of gas and it requires some little attention to regulate the amount. Gas burners have been noticed with large quantities of black carbon hanging about and the complaint is heard that the gas is poor, is mixed with air so as to hurry the gas meter and enrich the corporation. The very carbons hanging about in profusion is evidence that the gas and air are not mixed properly for burning and the fault lies with the consumer.

Prices Approaching the Danger Line.

ONE does not need to be a prophet to see that a reaction is imminent in the steel boom. Prices are being pushed up too rapidly with the stupenduous production under way. The lesson of 1899 seems to have been forgotten. The demand for immediate delivery and the premiums paid on steel products are ephemeral. They are trade wreckers. In the main the orders are small. When such consumers find they cannot get what they want they either substitute something else or do without. The inquiry leads the manufacturer to believe that a boom has set in and he will reap all the benefits. He advances prices and finds that suddenly buying ceases. The price is too high.

With the present production, should consumers keep out of the market for one month it will create an enormous surplus. It used to be that store houses were filled with standard products, but now the steel mills work according to specifications and stocks cannot be piled up. It can also be readily seen that furnace operators will not stack pig iron costing them from $12 to $15 per ton, whereas, they might increase their stock if it could be made for $8 and $9. It is becoming customary for consumers to order the bulk of their material at the beginning of the year. This leads to the belief that the tonnage of that particular year will be greater than the last. The bulk of orders having been placed during the early portion of the year there are only a few scattered orders remaining for the second half. This is the time when the reaction sets in. It looks as if 1902 will be a repetition of 1899. Had the Amalgamated strike not taken place last year such a state of affairs would have resulted in 1901 and the strike was really a benefit to the iron and steel manufacturers.

Greatest Consolidation Still Increasing.

THERE seems to be no limit to the ambition of the financiers who have taken control of our iron and steel industries. They have captured the iron ore mines, the shipping, coke production, finishing plants and are after the ocean transportation. Not content with this they have purchased a controlling interest in the largest engine building plant in the United States, according to a report from Milwaukee, which states that Judge Gary has taken charge of the Allis-Chalmers Company for the U. S. Steel Corporation. The Allis-Chalmers Company has an international reputation. It seems that the U. S. Steel Corporation is seeking control of the leading concerns in their respective lines.

BULGER COAL COMPANY'S NEW PANHANDLE MINE.

The latest mine to be opened up and put in operation in the Panhandle district is that of the Bulger Block Coal Company, near Bulger station, P. C. & S. L. R. R. The officers of the company are: President D. J. Kennedy; vice president, J. A. Kling: secretary and treasurer, J. C. Adams. The company owns 261 acres of coal and 11 acres of surface, upon which is a modern coal plant, fully equipped to produce and load coal in the most economical manner. The mine was opened up and all the construction work done from plans prepared by William

Bulger Coal Company's Modern Tipple.

Clyde Wilkins, the civil and mining engineer, Westinghouse building, Pittsburg, who also superintended the construction.

There are two openings to the mine, one shaft [illegible] feet in depth, where the coal is hoisted; the [illegible] opening a slope used as a man-way and [illegible] material into the mine. The tipple [illegible] frame is a substantial frame structure, [illegible] equipped with self-dumping cages, [illegible] Robinson Machine Company, of [illegible]. The tipple equipment is a [illegible] for loading lump, nut, slack, and [illegible], and was furnished by the Niles [illegible] Company, of Niles, O. [illegible] consist of a pair of 16 x 32 inch engines coupled to conical drums seven feet diameter at the small end, and nine feet at the large end. They were built by the Litchfield Manufacturing Company, of Litchfield, Ill.

The boiler plant consists of a battery of two 72 inch x 18 feet tubular boilers, built by R. Munroe & Sor, Pittsburg, fitted with Epping-Carpenter feed pumps and a Jacobs' feed water heater. The engine house is a substantial building 43 x 90 feet, built of buff brick, with slate roof, and divided into three rooms, one for the hoisting engine, one for the boilers, and the third for the electric plant. The latter consists of a Morgan-Gardner 250 volt direct current generator of 100 k. w. capacity, direct connected to a 165 h. p. Skinner automatic engine.

The coal cutting is done by machines, the machine mining plant consisting at present of five Morgan-Gardner improved mining machines. There are twenty-one miners' frame houses, all having slate roofs; frame blacksmith shop, stable and superintendent's office.

The plant is in successful operation, producing about 300 tons daily, which will be steadily increased until the output reachs 1,200 tons, the ultimate capacity of the plant.

IN AND ABOUT PITTSBURG.

As outlined in this paper several weeks ago the annual meeting of the Bessemer Coke Company approved plans for an addition of 200 coke ovens in the Griffin plant in the Klondike region of Fayette county. An issue of $200,000 in bonds was approved and the purchase of 300 acres of coking coal adjoining the Griffin property was authorized. The Griffin plant wil have 500 ovens. The new plant will be built at once. The company will then have an annual output of 600,000 tons of coke and 200,000 tons of coal. W. Y. Humphreys was re-elected president; Joshua W. Rhodes, vice president; Mermon Griffin, treasurer; and William Harris, secretary. E. H. Jennings, Dallas C. Byers and R. L. Martin, with the officers, compose the directors.

The building plans of Kenney & Company's new machine shops at Scottdale as adopted call for a main building 50 x 320 feet in dimension with a wing on either side 30x320 feet. The main building will have but one story running the full height. In this will be located the foundry which will be 120 feet in length and the remainder will be occupied by the heavier machinery. An electric crane will run the entire length of the building and reach every part of the floor surface. The wings will be two story buildings and will be occupied by lighter machinery, pattern shops, etc. The entire plant will be operated by electricity, and a number of Tesla polyphase motors will be used for this purpose. The plans for the building are to be ready to submit to contractors not later than February 1, and the contract will be awarded shortly after that date.

The Oliver-Snyder Steel Company, of this city, has bought 2,000 acres of coal land in Ligonier valley. It lies in the township of Fairfield, and Ligonier. It is of the Pittsburg seam, and recent tests have brought out the fact that it is of the standard quality. The purchase price was $200,000. The development of the tract will be begun about Ligonier, and the Ligonier Valley Railroad will be the outlet of the field. The Ligonier Valley coal has never been developed to any great extent. It was known that the entire valley was underlaid with the Pittsburg seam, but the farmers were unwilling to accept the offers made by various prospective purchases.

The Cadwallader Tin Plate & Metal Company, of this city, secured a charter January 28 with $150,000 capital stock to operate a tinning plant in Hazelwood. The company is at present engaged as tin plate and metal jobbers at Elizabeth street and the Baltimore & Ohio railroad crossing, Hazelwood. A building 50 feet square will be erected in which will be installed three tinning sets. An office building will also be erected. The company is in position to secure its supply of black plate but may later decide upon building its own plant for the production of plate. The company is composed of George A. Cadwallader, Joseph Cowley, F. H. Good, Samuel Hunt, Charles A. High, and H. S. Loughry.

Practically the final steps have been taken by the Baltimore & Ohio Railroad Company for the building of its shops at Connellsville. The plans, which have been altered considerably are arranged for a mechanical department building, 120 x 45 feet, equipped with modern machinery. The round house will have a capacity for 21 stalls, and there will be three drop pits and room for repairing three engines on the round house track. There will be a new turn-table, a blacksmith shop, boiler department, oil house, sand house and store room.

An item which appeared in these columns a few weeks ago concerning the James H. Baker Manufacturing Company, of this city, made it appear that changes in the officials had been made. The presidency of the company is still in the hands of H. W. Armstrong while the position of vice president and general manager is still held by James H. Baker. The item reversedthe positions.

The Kirby-Williams Company, of this city, has been organized and will soon build a plant at 216 South Main street, to deal in merchant pipe, pipe cutting, threading and bending, and second hand pipe and machinery. The company is in the market for several pipe cutting and threading machinery, and a 15 horse-power gas engine.

Options have been secured on about 2,000 acres of coal lands in the Eastern part of Washington county by John Frost, of Vanceville, and Elmer McIlvaine, of Monongahela. The price was $110 an acre.

Armour & Company have plans for a new three story brick cold storage plant to be built at Twenty-first and Carson streets, South Side. The company will install a large steam plant for which bids will soon be asked.

The Central Pipe & Valve Company, Allegheny, reports an active business. The company has installed a 20 foot plate shear, a large radial drill, and a pipe threading machine.

NOTES OF THE INDUSTRIES.

The William Tod Company, Youngsown, O.. has booked an order from the Youngstown Iron Sheet & Tube Company for a 54x66 inch return crank reversing blooming engine which will be used in the operation of the new open hearth steel plant it is about to build. The Republic Iron & Steel Company has contracted for a duplicate of this engine, which will replace the one in the blooming mill at the Bessemer plant. These engines when completed and set up will weigh about 750,000 pounds. They will be, it is said, the largest bloming engines in the world, the present largest probably being the 55 x60 inch engine in the Carnegie plant in Homestead.

Witherbee, Sherman & Company, of Port Henry, N. Y., have leased the Cedar Point iron furnaces at Port Henry to Messrs Pilling & Crane, of Philadelphia, for a term of years. Work will be begun at once to put the furnace in good shape and to enlarge the stove and engine capacity, which will greatly increase the output of pig iron. By April the furnaces will probably be ready to be blown in. The furnace at Port Henry has been idle for seven years. Pilling & Crane will also lease the Crown Point, N. Y., furnaces and will use iron ore from mines at Mineville, six miles from Port Henry, at both places.

The Pennsylvania Chain Company has been organized at Harrisburg, Pa., with a capital stock of $50,000. The following are the officers: President, Adjutant General Thomas J. Stewart: vice president, Alvin I. Miller; secretary and treasurer, D. W. Deming; manager, Charles D. Stucker. These four gentlemen, in conjunction with George B. Stucker, were elected directors of the company. The company will operate from 60 to 80 chain fires, and will manufacture all kinds of list chain, and all grades of coil and test chain.

The annual meeting of the Republic Rubber Company, Youngstown, O., was held recently. The following board of directors was elected: H. K. Wick, John C. Wick, George Tod, C. H. Booth, A. E. Adams and M. I. Arms. The directors organized later by electing H. K. Wick, president; C. H. Booth, vice president, and John Tod, secretary and treasurer. J. E. Davis was reappointed acting manager, and J. S. McClurg was appointed superintendent.

The Lehigh Valley Railroad is preparing plans for improvements to the Sayre, Pa., shops and yards which it is estimated, will result in an expenditure there of about $600,000. Besides the improvements being prepared for at the round house, twenty-nine sliding doors will be put in in place of the swinging ones, an addition to the machine shops is looked for and it is understood that plans are being prepared for it.

Architect Frank C. Miller, Philadelphia, is preparing plans for a manufacturing plant to be erected by a New York concern on the line of the Pennsylvania Railroad, near Frankford. Nine buildings are to be erected. The plans provide for three small buildings, measuring 30 by 100 feet, built of brick and frame, with gravel roofs; two brick, stone and iron buildings, three stories high, measuring 50 by 150 feet, with cement roofs, fireproof floors and freight elevators: one two story brick and iron fireproof building, 50 by 150 feet; a brick and stone fireproof heating plant, measuring 50 by 65 feet.

The stockholders of the Slatington Rolling Mill Company, have elected these directors: L. P. Hopkins, Elias German, Edward Edwards, W. J. Morton, A. S. Haines, Solomon DeLong and J. F. Unger. They organized by electing Mr. Edwards, president; Mr. DeLong, secretary and treasurer; and Lou Hopkins superintendent. The latter succeeds his father, the late William P. Hopkins, of Catasauqua.

The first bar of iron was rolled Monday morning at the new mill of the Youngstown Iron Sheet & Tube Company, Youngstown, O. Six puddle furnaces were started. It is expected the other eight will be ready in the course of a very short time. It is announced that one of the scrap furnaces will be lighted about the middle of the week and the sheet mill be started next week, or possibly a little earlier.

The stockholders of the United States Stan ing Company, Wheeling, W. Va., met recen and elected the following directors: Alb Shank, L. Stone, and A. G. Wincher, of Whe ing; R. R. Gilleland, of Bellaire, and C. A. W ver, W. C. Stewart and J. M. Saunders, Moundsville; W. C. Stewart was elected pre dent, and J. M. Saunders, secretary.

A new record has just been made at the Has ton furnace, of the Republic Iron & Steel Co pany, Youngstown. O. Wednesday of week the output of the plant was 392 tons. T record was for 24 hours. The next highest r ord, which was 364 tons in 24 hours, was made under the administration of the pres superintendent, Gerry B. LaVan.

The Youngstown Iron Sheet & Tube Compa Youngstown, O., has authorized S. V. Hube Company, Pittsburg, to draw the plans for new open hearth steel plant to be erecte a site between Haselton and Struthers.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—The problem of how to balance the urgency of the demand against the limitations of the capacity to produce all forms of material is still the leading point of interest in iron and steel. The growth of the demand is steady and keeps the plants swamped for deliveries in spite of the better movement of available cars for transportation, both ways, of raw iron and steel, and fuel. Considerable of the old tonnage that was dragged over from December remains in the market and to that extent is retarding the free movement of this year's business. All the producing plants are running weeks behind their business or the point at which deliveries would be placed had not the strike of the railroad men run concurrent with the shortage in cars and motive power, following so closely upon the heels of the strike of the steel workers.

Increasing strength in prices is the principal item in the markets after the problem of how to make production meet the demand. While a praiseworthy effort is making to prevent an inflation the natural weight of the markets is having the effect of sending prices slowly upward. The heavy tonnages that were contracted for in all lines at the close of last year had the effect of shortening up what would be the normal full supply on all classes of material. Those consumers who are not positioned to buy so far in advance are thus placed between the upper and lower millstones where they are being gradually comminuted. Bessemer pig iron is current at $16.25 and $16.50, at valley furnaces, while for spot shipment of car lots the price may be almost any rate the producer might ask. There is probably not a furnace in the country that has not its production booked solidly up to July while many have their capacity covered further into the year. Mill iron is high priced at the current quotation of $16.50 Pittsburg delivery.

Billets have failed to show any material ease in supply and are held at a minimum of $28 at mill. In this material the presence of the old delayed contracts is most noticeable and deliveries are still months behind with no prospect for catching up, if indeed there is any intention to overtake the old business.

The enormous tonnage in structural, plates and rails presents nothing new, the main proposition, as for weeks past, resting in the ability of the mills to keep pace with the urgency of the demand. Quotations and prices in actual transactions are unchanged.

The American Steel Hoop Company, Republic Iron & Steel Company, and the Eastern bar iron makers who started a campaign of higher prices last week in advancing the quotations on common iron bars from $1.50 to $1.60 have made no impression on the market. The larger Western makers exclusive of those named have made no change in prices or announced any intention of doing so.

Muck bar remains strong and steady at the rate of last week, $30.00 per ton.

CURRENT QUOTATIONS:

Basic	$16 75		Splice bars	1 50	
Bessemer	16 75	17 00	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	16 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 69	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Grey Forge, Shn.	15 60		No. 1 wrought	15 50	
Bessemer billets	27 50	28 00	No. 1 cast	18 00	18 25
Open hearth	29 00	30 00	Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined.		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Bolts, iron, sq nut.	2 50		Sheets, 26	3 00	
Hex nuts	2 65		Sheets, 27	3 10	
Standard sections.	28 00		Sheets, 28	3 20	
Spikes	2 00				

PHILADELPHIA—Extreme firmness and a active buying movement characterize the entire scope of the iron and steel markets. The trade has probably never known such a January as the present month. Buying for deliveries during the last half of the year is less common than for the first half, but there is enough of it to make a decided movement of the kind.

The local market is as active as the supply of pig iron will admit of its being. Iron for prompt delivery still commands a premium over future deliveries, and every effort is being made by producers to put out the largest possible product.

The melting of iron in the foundries and mills is it a rate unusual, if not unprecedented, at this season of the year. Prices on nearly all brands are higher than they were a week ago.

Several thousand tons of steel billets have recently been sold at $30, delivered, and one or two small lots at a little higher figure.

Finished iron and steel products are firm and tonnage remarkably heavy, considering the season of the year. The demand for structural material is enormous, with plenty of new business in sight. Plate mills are also doing very well, being fully employed, with excellent prospects for the first half of the year. The makers of sheets continue to report a good volume of business, contracts being placed for delivery many months ahead. Most of the bar mills are full of work, but in some localities they are not as busy as in others.

CURRENT QUOTATIONS:

Foundry, 1	$18 00	18 50	Girder rails	32 00	32 50
Foundry, 2	17 00	17 75	Angles, 3" & lr'gr	1 75	1 80
Gray Forge	16 00	16 50	Under 3-inch	1 85	1 90
Bessemer billets	29 00	30 00	T's 3" and larger	1 80	1 85
Open h'rth bil'ts	30 00	31 00	Under 3-inch	1 85	1 90
Steel bars	1 70	1 80	Heavy plates	1 75	1 80
Refined iron bars	1 90		Beams and chanls	1 75	1 85
Standard rails	28 00				

NEW YORK—The question of delivery leads all others in iron and steel and the immediate outlook does not show anything to give material relief to the situation. The buying has been so heavy and the current demand so strong and steady that the blast furnaces and steel finishing plants have not had time to catch up with the run of business. Deliveries of Southern pig iron are fair but the stringency everywhere cannot be relieved for some time. The extensive contracts have checked up the movement of current orders which must remain secondary to the large contracts.

Even more urgent than pig iron for the foundries and furnaces is the demand for structural sheets, bars, and the finished products generally.

The structural market is at its height for the contracts of last year have run into the work of 1902 on the books of the manufacturers and in actual construction which brings up a strong aggregate of tonnage immediately required to prevent cessation or even slight suspensions of operations on bridge building and general construction.

Prices as a whole are slightly higher than quotations for reasonably prompt shipments which are almost impossible to get.

Northern foundry pig iron for anything like reasonably prompt delivery is almost unobtainable. Quotations for approved brands are $17.15 to $18.00 for No. 1 X; $16.65 to $17.15 for No. 2 X; $16.15 to $16.65 for No. 2, plain tidewater delivery here. So great is the difficulty in obtaning iron that some large foundries are sounding the foreign markets, with the view of importing. No. 3 Middlesboro iron can be laid down here now at about $18 per ton, and quick shipments are obtainable. No business has as yet been reported, but negotiations are pending.

It is said that the Dominion Iron & Steel Company has been offering basic billets at $27 delivered at tidewater here, but as that company is not producing steel and may not be able to do so for months, such quotations are misleading.

There is no Southern coke for sale for delivery until July next, and there is no foundry coke obtainable in any territory for less than $2.75 at ovens.

Indpendent mills generally are well supplied with orders up to April delivery. Quotationsvary according to the conditions of each mill's order books. We hear of prices for large lots of No. 28 black rolled sheets for delivery inside of 60 days as low as three cents f. o. b. mill equal to Pittsburg delivery, others quote $3.10 for delivery in February, some are full of orders up to July.

Galvanized sheets may be had from some mills at 70 and 10 and 5 per cent off list.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$17 50	18 30
No. 2X fdy Jersey City	16 65	17 15
No. 2 plain Jer. C.	16 15	16 65
Sohn. 1 fdy N. Y.	16 75	
No. 2 fdy N. Y.	16 00	
No. 3 fdy N. Y.	15 50	
No. 1 soft	16 75	
No. 2 soft	16 ·0	
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and 1/4 red, at store, N. Y. per 100 lbs	2 30	2 40
Sheets, blue annealed, 10	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00
Plates 1/4 and heav	3 15	
Ship & tank plate, on dock	2 50	2 50
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10
Beams and chan'ls 15-in & under	2 00	2 50

Angles	2 00	[illegible]
Tees	2 00	[illegible]
Zees	2 00	[illegible]
Time deliveries, basis $1.75 for angles, beams and channels,		
Com. base, bars per 100 lbs	1 65	1 70
Refined base, bars	1 85	1 90
Bands, base	2 40	2 50
Norway bars	3 75	
Norway shapes	4 25	
Old T rails, iron f. o. b. cars	20 00	21 00
T rails steel f o b c	16 50	17 50
No. 1 wro't scrap iron f o b cars	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes	13 00	14 00
Old car wheels, f. o. b. cars	16 00	17 00
Old ham. car axl's f. o. b. cars	22 00	23 00
Wrought turnings deliv. at mill	11 50	12 00

CINCINNATI—Since last week there has been further improvement in transportation. This has given the furnaces a better supply of coke, enabling many of them to continue in operation steadily, which results, of course, in increased output and more liberal supply of iron to impatient consumers.

The demand for iron keeps up remarkably strong, though of necessity the sales are chiefly for deliveries through the latter half of the year, though here and there furnaces are taking on orders for earlier shipments where there is an open place in the order books. Charcoal irons have been in large demand during the week and some important orders for Lake Superior and Southern have been entered. Georgia and Alabama charcoal irons have advanced another 50 cents per ton.

Northern coke foundry irons are generally firm; sales have been made of some choice brands at $16.50 for No. 1 and $16.00 for No. 2 cash f. o. b. Ohio furnaces. Northern grey forge is about taken up for delivery through the first three or four months of the year. The demand for Bessemer and basic by the steel works continues heavy and the supply of the furnaces making merchant foundry and forge grades will continue to be limited.

The Southern iron market is steady and prices well maintained.

The increased production of pig iron will serve to check the tendency toward a wild market that the leading conservative producers have controlled quite well thus far, but the continued heavy demand keeps the situation strong and the market closes with prices very firm.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$15 50
South fdy. 2	14 75	15 00
South. fdy. 3	14 25	14 50
South. fdy. 4	13 75	14 00

Steel hoops	1 95	[illegible]
Sheet, 26	3 50	
Sheets, 27	3 35	[illegible]
Sheets, 28	3 45	[illegible]

Grey forge	13 75	14 00	Angles, 3 to 6 in	1 75	2 50
Mottled	13 75	14 00	Angles, 1¼ to 2½	1 75	2 50
Shn. 1, soft	15 25	15 50	Beams and Chanls 15 in and under	1 75	2 70
Shn 2, soft	14 75	15 00	I b'ms 18, 20 24 in	1 80	1 50
L. Superior, fdy. 1	17 25	17 50	Tees	1 75	1 85
L. Superior, 2	16 75	17 25	Z's	1 70	1 80
L. Sup'r char'l c w	19 25	19 75	1 wrought scrap	12 00	18 05
Hang'g r'k ccl, 1	20 50	21 50	Steel milting stock gross ton	11 50	
Sohn ccl w	19 25	19 75	No. 1 cast	11 00	
Jakson cy. silv'y 1	16 75	17 52	Old iron rails g t'n	15 00	
St'l brs base hlf ex	1 75	1 90	Old car wheels	14 50	
Iron bars	1 75	1 90	Cast borings	5 00	
Flange plates	1 82	1 92	Turnings	5 50	
Tank steel	1 72	1 82			
Ordinary fire-box	1 92	1 97			
T rails	36 00				

CHICAGO—There is hope for the pig iron consumers in this district in the fact that the idle blast furnaces have resumed operations and the current output is practicaly restored, though there may be some decrease in the production of foundry grades because of larger steel requirements. But the market is bare of spot iron and there is little prospect of early improvement. The better grades are freely selling at premiums of from twenty-five to fifty cents above open quotations, the demand coming largely from small consumers who are not protected by contracts. The trading in futures is not so keen as a week or two ago but remains considerable. Much of it consists of supplementary orders for delivery during the second quarter of the year.

Most of the Western bar iron mills have sold their output for the next three or four months and in consequence the market has advanced about $2 per ton. There is little bar iron to be had and some factors of the trade are talking about further advances, though this policy receives discouragement from some producers. Steel bars are unchanged but the demand is quite active and prompt shipments are the exception rather than the rule. Structural material is called for in large quantities. Rails continue to move in small lots for distant deliveries. Merchant steel has a strong look, sheets are doing very well and plates are about the only product that is inclined to lag.

Scrap is in excellent demand and offerings are not sufficient to satisfy wants. The tone of the market is therefore strong, though quotations are perhaps not any higher.

CURRENT QUOTATIONS:

Bessemer	18 00	18 50	Sheets, 26 store	3 20	3 30
Fdry Sohn 1	16 50	17 50	No. 27	3 30	3 40
Northern 2	16 00	17 00	No. 28	3 40	3 50
Northern 3	15 50	16 50	Angles	1 75	
Southern 1	16 40	16 90	Beams	1 75	
Southern 2	15 90	16 40	Tees	1 80	
Southern 3	15 40	15 90	Zees	1 75	
Forge	14 90	15 40	Channels	1 75	
Charcoal	19 50	20 00	Steel melt'g scrap	14 00	14 50
Billets, Bessemer	30 00	32 00	No. 1 r. r. wrought	15 50	16 00
Bars, iron	1 75	1 80	No. 1 cast, net ton	12 00	12 50
Bars, steel	1 65	1 70	Iron rails	21 00	22 00
Rails, standard	26 00		Car wheels	16 00	17 00
Rails, light	31 00	34 00	Cast borings	5 50	6 00
Plates, boiler	1 90	2 00	Turnings	10 00	10 50
Tank	1 75	1 80			

BIRMINGHAM—The Sloss-Sheffield Steel & Iron Company has been compelled to decline orderst his week some for round lots. Many inquires are coming in for the last half of the year. The foundrymen who failed to cover their wants of the first six months of this year having a hard time of it.

The furnace companies are put to their wits' ends to fill the orders now on their books. They are not disposed to advance prices further, but if the demand continues, they will be compelled to either put up the price or notify their agents they have no iron to sell, as all their product will be entered in a short time. Trouble continues in regard to coke, although some improvement has taken place in deliveries.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 00	12 50	Tank	1 80	
No. 2 fdy, Sohn	11 75	12 00	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 00	11 25	No. 1 wrought	14 00	
Grey forge, Sohn	10 50	10 75	No. 1 cast	12 00	
Billets	27 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	310	3 50
Fire box	2 00				

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including January 27, 1901:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUN
Transit	636,842	382,968
Tidewater	189,386	84,953
Southwest	5?,685	236,729
Eureka	34,080	871,098
Buckeye, Macksburg oil	81,740	336,960
New York Transit	604,181	
Southern	574,029	....
Crescent	201,038	....
Total	2,376,631	1,912,708
Daily averages	91,464	73,939

LIMA.

Buckeye / Indiana Local Division	1,266,955	1,284,632
Daily average	48,802	49,409

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
January 22	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
January 23	1.30	1.15	1.15	0.83	0.80	0.80
January 24	1.30	1.15	1.15	0.83	0.80	0.80
January 25	1.30	1.15	1.15	0.83	0.80	0.80
January 27	1.30	1.15	1.15	0.83	0.80	0.80
January 28	1.30	1.15	1.15	0.83	0.80	0.80

Coal.

PITTSBURG—The question of car supply and the demand of the miners for an advance in the wage rate for the approaching scale year have stirred up the market in its way but aside from practically making sure that the cost of coal will be higher this season than last at the lakes and the Northwest docking points and that the supply may be considerably shorter, there is nothing new in the case.

CINCINNATI—The weather has favored the coal handlers but the condition on the rivers has assisted the consumers in that the shipping companies have been able to keep the market well supplied with ready coal. There is no further talk of higher price but the indications point that way after the heavy shipping period gets under way for the season's contract work.

CLEVELAND—The question of the engineers' troubles, and the problem of transportation for coal if that matter is ajdusted, form the only points of interest in the coal market. With the proposed increase in the ore tonnage with the heavier lumber and grain movement the transportation of coal to the upper lake ports becomes of much more importance. The boat owners say they see in advance higher tonnage rate and the outlook is for a stand for a higher uniform rate for the entire season

CHICAGO—The coal trade is filled with rumors of an early announcement of the formation of the combinations of Illinois and Indiana coal properties. This divides with the interstate convention at Indianapolis this week the thoughts of coal men, diverting it somewhat from the usual channels of business. Very little improvement of mining properties is in progress, machinery men saying they are doing next to nothing by way of new business. The market has grown easier. Eastern fuels are arriving in enough abundance to wipe out the keen demand that has existed for months. Dealers and consumers, however, are stocking up and there is no large surplus. Dock prices of bituminous coal are very firm and no variation is noticeable. Western products are ample for current requirements and the quotations of a week ago are maintained. The colder weather, however, may modify the situation in a few days. Coke, too, is arriving in more suitable quantities and this week all serious consequences from an insufficient supply will, it is predicted, be removed.

Coke.

Coke production made a slight increase in the Connellsville region last week but the shipments were not quite up to the record of the week previous. The car supply to Pittsburg furnaces was much better than for several weeks but the return of empties for Western and Eastern points were delayed and shipments to these points were lighter than the week previous. The car supply to the Masontown field was better and a gain in the shipments from the new field was made.

The railroads continue to add to the motive equipment and contend that movement of coke trains will improve with each week. The B. & O. is making some decided changes in the operating department that are expected to simplify train movement and enable the road to handle a greater amount of coke traffic. As the car supply becomes normal coke stocks at the furnaces will increase and a general by better one prevail. With sufficient transportation facilities there need be no scarcity of coke, and the yield for 1902 will be the largest in the history of the trade.

A summary of the Connellsville region for the week shows 21,605 ovens in blast and 1,112 idle.

The following figures show the scope of operations.

Production for the week	223,231 tons.
" last week	220,671 tons.
Increase	2,560 tons.
Shipments—	
To Pittsburg and river points	3,826 cars.
To points West of Pittsburg	5,450 cars.
To points East of Everson	1,837 cars.
Total	11,113 cars.
Last week	11,340 cars.
Shipments in tons for week	248,486 tons.
" " " last week	252,315 tons.
Decrease	3,829 tons.
Masontown Field	
Shipments for week	588 cars.
" last week	567 cars.
Increase	21 cars.
Shipments in tons	15,288 tons.
" last week	14,762 tons.
Increase	1,526 tons.

Coke Prices.

Pittsburg—Furnace, $2.25@2.50. Foundry, $2.50@2.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.25@4.50
onega, $4.25.

The plant of the Atlantic Iron & Steel Company at New Castle, Pa., will not close for repairs until July, when the company contemplates doubling the capacity of its furnace.

The United States Cast Iron Pipe Company has put on a double shift at its Bessemer, Ala. plant in order to keep up with the demand for the output.

OBITUARY.

WILLIAM M. SEYFERT.

William M. Seyfert the last of the old Berks county iron masters, who made famous the furnace banks of Eastern, Pa,: died a few days ago at Philadelphia. He was 80 years of age.

On the death of his father, Simon Seyfert, in 1848, William succeeded to his interest in and as president of what is now known as the Reading Iron Works. Prior to that he had participated in the construction of the Croton aqueduct, New York, with his brother-in law, John McManus, one of the contractors on that work. During the civil war the firm of Seyfert, McManus & Company did a great deal of work for the government, as well as for other manufacturers who supplied the government, and the business continued to extend for many years subsequent to the war. Mr. Seyfert was one of the promoters of the Texas Pacific Railway; was a friend and co-worker of Edison's, and engaged in several important independent interprises.

Personal.

W. A. Kingsley, of Youngstown, has tendered his resignation as sales manger of the American Steel Hoop Company, and will engage in other business. Mr. Kingsley formerly was connected with the old Pomeroy mill. He has been succeeded by B. E. Hamilton, who has been in the sales office.

Brete C. Davis has been appointed assistant master mechanic at the Ohio steel works of the National Steel Company in Youngstown, and has entered upon his duties. Mr. Davis takes the place of Leon E. Thomas, who was appointed assistant superintendent of the works of the Lloyd Booth department of the United Engineering & Foundry Company.

Erskine Maiden has tendered his resignation as master mechanic at the Bessemer plant of the Republic Iron & Steel Company and will go to the Ohio works of the National Steel Company. Mr. Maiden will be chief engineer under the master mechanic at the Ohio plant.

John Vanderslice for the past four and a half years superintendent of the Keystone bridge works department of the Carnegie Steel Company has associated himself with L. V. Blue, local representative of the Akron Tool Works Company, and the Wheeling Mold & Foundry Company.

Daniel Ashworth, Horne building, has been appointed general sales agent for the C. W. Hunt Company, West New Brighton, N. Y., builders of industrial railways for handling heavy and bulky material in industrial establishments.

The Parkersburg Organization.

Permanent organizatson of the Parkersburg Iron and Steel Company was effected at Parkersburg, W. Va., last week and the following officers and directors elected: President, H. H. Nieman, formerly president of the Canonsburg Iron & Steel Compano; vice-president, H. S. Duncan, who was a charter member of the Canonsbu-g Iron & Steel Company; vice-president and general manager of works, D. F. Budke, state senator and former manager of the Canonsburg Iron & Steel Company: treasurer, L. A. Meyran, formerly secretary and treasurer of the Canonsburg Iron & Steel Company; secretary, A. H. Geilfuss, who was assistant secretary of the Canonsburg Iron & Steel Company; for 16 years. The following comprise the board of directors: A. E. Succop, H. H. Neiman, H. S. Duncan, J. F. Budke, A. H. Geilfuss, A. E. Nieman, L. A. Meyran, W. R. Geilfuss, George W. Flowers, F. W. Budke, Charles H. Geilfuss, and W. H. Paxton.

The company has an authorized capital stock of $500,000 of which $400,000 is issued. The plant is located at Parkersburg, W. Va., and is in partial operation, producing high grade sheets from 16 to 30 gauge up to 42 inches in width. Four mills are in operation and two additional mills are under construction. The combined capacity of the six mills will be 70 tons daily.

The main building is 486 by 120 feet and contains room for six additional mills which will be installed within the next year. The company has bought the stamping plant of the Budke Manufacturing Company, at Canonsburg, Pa., which will be removed to Parkersburg, and enlarged, and a tin dipping plant in this city. An additional building 110 by 225 feet will be erected adjoining the mill building for a skelp and bar mill. The company will also install a forging department to make hammered iron blooms production for sheet. A tin dipping plant will also be installed at Parkersburg. The entire plant will be in full operation by April and the main office of the company, which is located in the Times building, this city, will be removed to Parkersburg.

Grant & Williams, Park Row building, New York, have about completed tearing down the large iron self-supporting derrick that was set up on the steam-boat docks at Fall River, Mass., about 40 years ago. The dock has been a conspicuous land-mark in that vicinity for a number of years, having been constructed especially for the handling of heavy material for steamboat construction, with a capacity for lifting 100 tons.

Pittsburg Items.

Ground has been broken for the large 10-mill sheet plant of the Rolling Mill Company of America, at South Connellsville, and the work will be pushed to completion as rapidly as weather and ordinary conditions will permit. All the contracts have been let for the buildings and equipment of the mill. The plant will consist of four principal buildings having a floor space of 66,500 square feet. The main building will be 410 x 108 feet; finishing building, 300 x 50 feet; packing, shipping, and store room, 150 x 30 feet; boiler house, 40 x 80 feet. These buildings will all be of steel and brick, and the main building will be equipped with the latest improved 15-ton double-hoist crane. The rolls will be driven by two 36x 60 inches Hamilton-Corliss engines made by the Hooven, Owens & Rentschler Company, Hamilton, O., with fly wheels 30 feet in diameter, each weighing 82 tons. These are probably the largest fly wheels used in this country. Each engine will be capable of developing 1,600 horse-power. All the remainder of the machinery will be operated by electricity. The plant will be equipped throughout with every labor-saving device known today and will in every particular be an up-to-date, modern, model mill.

The Sterling Automatic Instantaneous Water Heater Company will apply for a charter February 18 with $5.000 capital stock. The company will locate a plant in Allegheny for the manufacture of an improved water heater, the invention of William A. Bollinger and James Tracy. Entire equipment will be purchased. The incorporators are Anthony J. Boucek, James Tracy, William A. Bollinger, William T. Sigmund and William V. Moeller.

W. S. Vandyke, of West Newton, representing the Pittsburg Coal Company has bought the farm of Christopher Baer, near Mendon. The tract contains 140 acres of the best quality of coal. The purchase includes surface and minerals. This practically gives to the Pittsburg Coal Company all of the coal between Mendon and Port Royal. A big works is to be established on the Baer farm, and a branch road built to connect it with the works at Port Royal.

Percy Hunter, the well-known mechanical engineer of this city, has acquired an interest in the structral iron works of N. D. Yant, Allegheny. The firm will be known hereafter as N. D. Yant & Company. A number of improvements are contemplated to the company's works which will include the equipping of the adjoining building, 841 and 843, Pennsylvania avenue, to treble the capacity of the present plant. The company is in the market for equipment.

Samuel O'Neil & Sons, of Pittsburg, have bought land near Beaver Falls, Pa., and will build a brick plant. The land lies along the Beaver river and has a fine quality of clay. A part of the product will be enameled brick. The capacity of the plant will be between 60,000 and 75,000 brick a day.

Grant C. Nobbs has located a sheet metal working plant at 2520 and 2522 Smallman street, this city. The products of the plant are steel stacks, forges, exhaust pipes, tanks, etc. Further improvements are contemplated which will require additional machinery.

George McClain & Company, of this city, have sold the buildings belonging to the old sheet mill property at Niles, O., to Hubbard & Company, shovel manufacturers, also of this city. The purchaser will use the structural material to extend their plant.

The Ellsworth Coal Company is preparing to make extensive additions and improvements to the works at Scenery Hill, near Washington. It is the intention to sink five new shafts and increase the output threefold.

An application for a charter was made January 13 by the Herman Brick Company, of Allegheny. The incorporators are Frederick Herman, George F. Peters and Andrew E. Edmonds.

The Metal Markets.

LONDON—Tin—£108 10s-£105 15s. Sales, 200 tons spot; 660 tons futures.

Copper—£49-£48. Sales, 575 tons spot; 2,450 tons futures.

Lead—£11-£10 2s 6d.

Spelter—£16 15s.

NEW YORK—Tin—$24.50-$24.12½.

Copper—Lake, $11.12½, electrolytic $11.00; casting, $11.00.

Lead—$4.00.

Spelter—$4.35-$4.25.

All of the machinery and other stock in trade of the Iron Clad Paint Company, Cleveland, O., has been sold to the Cleveland Facing Mills Company, which is operated by the J. D. Smith Foundry Supply Company. It is the intention of the latter firm to enlarge its Carter street plant.

The Forsyth Pattern Works, Youngstown, O., will soon acquire additional property on which it will build a three-story building. The increased success of the Forsyth firm demands larger quarters.

Coke is being substituted for anthracite coal as fuel in many of the Schulykill Valley blast furnaces.

Industrial Notes.

The directors of the Belfont Iron Works Company, Ironton, O., held a semi-annual meeting a few days ago and elected S. G. Gilfillan director to fill the vacancy caused by the death of John G. Peebles. B H. Burr was elected president and general manager, the first office being that held by the late Mr. Peebles. Robert Peebles. of Ashland, was elected vice-president. A semi-annual dividend of 15 per cent, payable February 1, was declared. The directors took the preliminary steps for building another large blast furnace alongside the present furnace. The surveys will be made at once, and it is proposed to make it of about equal capacity with the present furnace.

It is announced that the drafting force of the Columbus bridge plant, recently sold to the American Bridge Company, will shortly be moved to Pittsburg, to secure more direct co-operation between the plant and the headquarters of the National Company, at Pittsburg. Beyond this there will be no other change in the management of the Columbus mills. There are 14 men employed in the drafting department.

The United States Steel Corporation has secured control of the Allis-Chalmers Company, t e largest machinery company in the world. Judge E. H. Gary is chairman of both boards of directors. Edwin Reynolds, general superintendent of the Allis-Chalmers works, has resigned. The Allis-Chalmers Company is capitalized at $25,000,000, and at the quarterly meeting last week a dividend of 1¾ per cent was declared.

The large brick plant which was constructed and for a time operated by Captain Jackson Arnold, at Weston, W. Va., has been sold to H. J. Price, of Fairmont. Mr. Price will take charge of the plant with in a short time and it will be operated on full time.

D. & G. Griese, general contractors, Cleveland, O., have obtained the contract for erecting the new building for the National Carbon Company at that place. The work will not be started for several weeks. The same contractors also have the contract for a foundry building for the Johnson-Jennings Company.

The Durham Iron Company took possession of [th]e Durham furnace, at Riegelsville, Pa., last [w]eek. Bricks for re-lining the furnace have been [o]rdered and are expected to arrive soon. In six [w]eeks after their arrival the furnace will be [r]eady to light.

The American Can Company's plant at Havre [de] Grace, Md., will shortly be removed to Balti[m]ore and consolidated with the extensive Nor[t]on plant in that city.

The Marting Iron & Steel Company, Ironton, O., held its annual election a few days ago. The directory organized by electing Col. H. A. Marting president; C. B. Fowler, vice president and superintendent, and T. J. Gilbert, secretary and treasurer. Mr. Gilbert, who succeeds Col. E. J. Bird, Jr., as a director, is from New Haven, Conn.

Joyce Brothers, Grafton, W. Va., intend to build a brick plant at that place to have a capacity of 25,000 brick daily. The firm is securing estimates on the building, machinery, power plant, etc.

Architect Frank C. Miller, Philadelphia, is preparing plans for a factory plant in Kensington. It will be a three-story brick building, erected on the slow-burning mill construction plan, 80 by 100 feet.

The Northside Iron Company, of Sharpsville, has elected S. A. Robinson, president; Andrew Nickle, vice-president; C. B. Kantner, secretary and treasurer. The company will secure a state charter and build a blast furnace.

The machinery of the Youngstown plant of the American Can Company is being taken out preparatory to shipment to Chicago.

Pawling & Harnischfeger, Milwaukee, Wis., are in the market for an 18 or 20-inch slotter

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Wire and Nails.

Wire, plain, car lots, jobbers	$2 05
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 25
Cut nails, less than car lots, retailers	2 35

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10	c
Copper, light bottoms	8	c
Heavy Composition	9 to 10½	c
Brass Turnings	6½	
Heavy Brass	7 to 7½	c
Light Brass	6.00	
Heavy Lead	3.75	
Tea Lead	3.50	
Zinc Scrap		$3.00
No. 1 Pewter	16	

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight, 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.
Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4.75.

Engineers Still Dissatisfied.

Regardless of the action of the Marine Engineers' Beneficial Association or any other consideration, except their own desires, the second engineers, who are included in the association, have refused to work for what the Pittsburg Stamship Company has offered, or for any other company which adopts the same policy and wage scale. The men say that this is not a strike, but that they are looking out for their own best interests. The Pittsburg Steamship Company has its list of appointments for the year about made out, with the possible exception of a few seconds. The engineers say that the company will wait longer than before for these engineers. The statement is also made that some of the other steamship companies have been trying to employ second engineers and find that it is impossible. This brings out a statement from the second engineers who object to the recent reclassification of boats made by the Pittsburg company and followed by the other lines. On second-class steamers the yearly contract calls for $720 a year, as made out by the Pittsburg company and others. The second engineers say that rather than take this salary they will wait until the season opens and hire out by the month. They say that they are holding for $100 a month, but would be willing to take $90. The contract calls for $720 a year, or $60 a month for twelve months. They say that it is cheaper for them to hire out by the month for nine months at $90, and then stay at home the other three months than to be gone all year and get only $720.

The engineers as a whole have another grievance which will likely come to the front this spring. It is that the second engineers are now being hired from the general office instead of the chief. The plan they say, makes discipline impossible. They may ask that the system be changed.

Eastern Men Getting Together.

Independent manufacturers of the Central Western manufacturing district have decided to form an organizaton to regulate prices and secure a source of raw material outside of the United States Steel Corporation. A meeting will be held in Pittsburg, February 3, and among the Eastern firms to be represented are William and Henry Rowland and Alan Wood & Company, of Philadelphia. Other firms which will send representatives are the American Sheet Iron Company, Phillipsburg, N. J.; Coatesville Rolling Mill Company, Coatesville, Pa.; Lalance & Grosjean Manufacturing Company, New York; Lebanon Rolling Mills, Lebanon, Pa.; Marshall Iron Company, Newport, Del.; Marshallton Iron & Steel Company, Marshallton, Del.; McCullough Iron Company, Wilmington, Del., Theodore Oliver, Easton, Pa., and J. Wood & Brothers Company, Conshohocken, Pa.

Technical Bodies.

The thirty-second annual meeting of the American Institute of Mining Engineers will be a purely formal session, in the office of the secretary, 99 John street, New York, February 18, at noon, for the purpose of counting ballots and the presentation of the annual report of the Council, which will be subsequently printed and distributed, as usual. The titles of all papers accepted will also be presented, and these papers will be printed and distributed for discussion at an adjourned meeting bearing the same number, to be held, probably, at Philadelphia during May or June. Particulars will be announced later.

A business meeting of the Engineers' Club of Philadelphia will be held Saturday, February 1, at 8 p. m. After the result of the balloting for new members is announced, C. H. Ott will read an illustrated paper on "The Improvement of the Channels of the Delaware and Schulykill Rivers by the City of Philadelphia." At the last meeting the resolution urging the official adoption of the metric system for the United States was laid upon the table.

Production at Ironton.

The Register, Ironton, O., gives some figures showing the production of some of the industrial plants in that place during 1901. The Union Iron & Steel Company, running from July 9 to January 1, made 16,100 tons of iron; Sarah furnace produced 39,871 tons of iron during the year; Hamilton furnace produced 42,160 tons; Lawrence furnace made an average of 38 tons daily when in operation; Vesuvius furnace was operated a good portion of the year and made about seven tons of charcoal iron daily; Hecla furnace was out of blast during the year.

The Olive Foundry & Machine Company had gross receipts $57,416.03 and used 1,500 tons of iron; the Eagle mill produced 14,142 tons of muck iron and scrap bar and 14,442 tons of finished material; Foster stove works made 36 heats with a total of 1,125 tons of iron.

E. R. Caldwell & Company, Bradford, Pa., are preparing to enlarge their plant by the addition of a foundry of increased capacity. Work on the addition to the present structure will be commenced as soon as the weather will permit.

Plans have been posted in the office of William S. Steele & Son, Philadelphia, for a one-story building for the Philadelphia Pneumatic Tool Company, at Twenty-first and Lippincott streets. The building will have a frontage of 96 feet, and a depth of 130 feet, will be of brick, with flagstone trimmings, and have a slag roof surmounted by three skylights. There will also be a one-story brick extension with dimensions of 22 by 50 feet.

The annual meeting of the Tyrone Mining & Manufacturing Company, Tryone, Pa., was held recently at which the following board of directors was elected to serve the ensuing year: A. G. Morris, Charles L. Stewart, William L. Lowrie, John L. Porter and S. C. Stewart. The newly elected board of directors organized by electing A. G. Morris president and S. C. Stewart secretary and treasurer.

The stockholders of the New Castle Forge & Bolt Company, New Castle, Pa., have organized for the coming year. The following officers were elected: President, Frank Ryman; vice president, W. H. Parks; secretary, J. Norman Martin; treasurer, J. B. Whieldon. The erection of the plant is being pushed rapidly. The machinery is being put in and it is expected the plant will be ready to begin operations by February 1.

Ore Situation at Cleveland.

The members of the Ore Association have finished their work for the season, and the market is ready for sales. It is expected that some good sized transactions will be reported before the close of the week. The significant part of the action just taken is that it had no reference whatever to the scaling down of estimates of production during the year. It was expected that an association on the price of old ange non Bessemer and the Mesabi ores would be formed, and that the production would not permitted to exceed a certain fixed amount, which it is considered safe to try to market and maintain the price. The failure to come to an agreement as to the price leaves each individual producer at liberty to put out as much ore as his machinery can take from the mine, with the result that there is likely to be a flood of ore on the market this year. The production, however, will be regulated by the previous sale, and the competition of the big producers to obtain contracts will be sharper than it would have been with the association idea prevalent. Whether the price will be affected by this competition is for the future to decide, but the likelihood is that the mining companies will not be able to obtain as satisfactory a price with the competitive system in vogue as if the association had been forrmed. It looks very much now as if the market will show no deviation from last year's prices in any respect, especially as the lines have announced their adherence to the same base price as last year, namely $4.25 for old range Bessemer ore.

Concerning the rate of carriage, nothing has been determined so far, and from what can be learned the Pittsburg company, which is expected to lead in the chartering, will not be ready for a couple of weeks at least.

The Steel Car Statement.

The stockholders of the Pressed Steel Car Company met in Jersey City, January 22. Few stockholders not members of the board were there, the board members carrying proxies. F. N. Hoffsot, A. H. Larkin, J. W. Friend, J. H. Reed, T.H. Given, H. E. Moller, Henry Phipps, G. E. Macklin and F. G. Evl, were elected directors. The directors declared the regular quarterly dividends of $1\frac{3}{4}$ per cent on the preferred and one per cent on the common stock. It was stated that the proposed consolidation with the American Car & Foundry Company was not discussed. It was said that orders on the company's books represent $20,000,000 assuring steady work throughout the year. The year is expected to be a record breaker in foreign trade. Vice President Greene read the annual statement. The balance sheet for the year ended December 31, 1901, shows:

Assets—Properties and franchises, $25,615,831; additions to plants in 1901, $441,771; stocks owned, $139,000; unaccrued taxes and insurance, $18,365; accounts receivable, $1,813,596; stock and material on hand, $4,898,272; cash, $1,301,727; total $ 34,228,565.

Liabilities—Common stock, $12,500,000; preferred stock $12,500,000; 5 per cent gold notes, $5,000,000; purchase money mortagage, $235,000; accounts payable, $1,838,790; accrued salaries and wages, $126,987; accrued interest, $108,86[illegible]; accrued dividends, $218,750; surplus balance January 1, 1901, $1,812,284; common dividend $500,000; charges of previous years, $521,463; balance, $1,021,403; final balance $790,881.

Surplus, $909,829; total $34,229,565.

Profits for 1901, $1,927,925; depreciation and renewals, $143,635; dividends on preferred, $875,000; total $1,018,635; surplus, $909,290.

Rushing Machine Deliveries.

Contracts have been awarded by John H. Hansen, president of the newly organized Standard Steel Car Company, for machinery for the new plant that will cost $500,000. Plans for the building are being prepared. The site will be outside of the city, for the reason that sufficient ground cannot be obtained here in an eligible location. It is probable that the proposed car wheel plant of C. T. Schoen, and President C. M. Schwab of the United States Steel Corporation, which will be a closely allied concern, will be located on plot adjoining the Standard car plant.

The machinery is of the heaviest and most improved pattern, and provides for a daily capacity of 50 complete steel cars. Three presses varying in capacity from 200 to 1,000 tons, have been ordered from the Mackintosh-Hemphill Company, of Pittsburg. The punches and shears have been ordered from Hilles & Jones, of Wilmington, Del., and the riveters will be made by the Chambersburg Engineering Company. The electrical apparatus will be made by the Westinghouse Electric & Manufacturing Company, and the electric cranes will be furnished by the Saw Crane Company, of Muskegon, Mich.

The machinery contracts stipulate that shipments for the plant must begin within three months, and that all of the machinery must be on the ground within five months. It is expected that the plant will be ready for operation by July 15.

A new world's record was made this week in the Brown Bonnell mills of the Republic Iron and Steel Company, Youngstown, O., when William's bar mill rolled 214,600 pounds of iron.

Patents.

The following patents granted January 21, 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit. Patent Attorney, Park building, Pittsburg, Pa., from whom printed copies may be procrued for 15 cents each:

Apparatus for continuous rolling direct from fluid metal, C. W. Bildt, Worcester, Mass.; automatic heat controller for steam boiler furnaces, D. H. Darrin, Cranford, N. Y., and Embury McLean, Brooklyn; supplying water to steam boilers. H. A. Fleuss, Staines, England: boiler furnace, C. W. Hunt, West New Brighton, N. Y.; method of electric welding, R. H. Hunter, Philadelphia; manufacture and treatment of armor plates, B. K. Jamison, Philadelphia, assignor to the National Steel Refining Company, of Delaware (3); hydraulic press, F. E. Keyes, Holyoke, Mass.; compensating high-duty compound engine, George de Laval, Cambridge, and G. F. Aborn, Boston, Mass.: liquid fuel feed for explosive engines, A. W. Olds, Hartford, Conn.; gas or oil engine, Elihu Thomson, Swampscott, Mass.; piston valve for air compressors, B. L. and W. P. Brinton, Bradford, Pa.; steam boiler, Frank Burger and H. M. Williams, Fort Wayne, Ind.; flue cleaner, A. A. Hull, Knoxville, Tenn.; compound explosive engines, F. W. Toedt, Hamburg, Iowa (2); water tube boiler furnace, W. C. Wallace, Sheffield, England; process of regaining tin, Paul Bergsoe, Copenhagen, Denmark; plant for coke making, Walter Kennedy, Pittsburg; apparatus for metal rolling, Joseph Morgan, Johnstown, Pa.; compound engine valve, Sweeney Munson, Alliance, Nebr.; steam condenser, W.E. Padridge, Detroit, Mich.; steam boiler, N. P. Stevens, Concord, N. H.; brass founders' melting furnace, A. J. and E. H. Weatherhead, Cleveland, O.; steam engine, R. T. Abell, Cleveland, O.; apparatus for pouring metal into molds, J. V. Coleman, San Francisco, Cal.; glass pot furnace, H. L. Dixon, Pittsburg; machine for forming, shaping, hardening and tempering metal blanks, E. E. Fay, New York; enameling metal ware, William Jankowski, St. Louis; steam generator, William Morgans, Chelsea, England; open hearth steel process, J. L. Smith and Robert Redford Jr., Eaglescliff, England; clutch, Herman Moon, Grove City, Pa.: process of and apparatus for feeding fine fuel, C. Carpenter, N. Y.

Steam pump, Arthur Abendroth, Berlin, Germany; tube welding apparatus, T. J. Bray, Jr., Pittsburg; apparatus for cooling fish-plates in the process of manufacture, R. B. Charlton, Milwaukee, assignor to the Continuous Rail Joint Company of America; apparatus for delivering melted glass, C. W. Foster, New York; valve gear for engines, Oswald Jackson, Carollton, Ill.; mechanical stoker, J. W. Kincaid, Covington, Ky.: water outlet for steam lines, J. F. Logue and J. K. Gano, Griffith, O.: steam boiler furnace, T. G. Macy, New York; apparatus for marking castings, J. J. Carroll, Cleveland, assignor to the National Malleable Casting Company, same place; manufacture of pipe fittings, C. A. Dies, Chicago; apparatus for controlling iron in blast furnaces, Luther Lincoln, Boston; chimney valve for hot blast stoves, Thomas Morrison, Braddock, Pa.; lubricating pump, J. F. McCanna, Chicago; gas engine, Cyrus Robinson, Edgewood Park, Pa., assignor to the Westinghouse Machine Company; engine bearing and adjusting means therefor, same, assignor to same; fly-wheel, same, assignor to same; igniter controlling mechanism for explosive engines, Jesse Walrath, Racine, Wis.; apparatus for rolling hollow or solid bodies, Josef Giesholdt, Dusseldorf, Germany; lubricator, Henry Ritter, Cincinnati, assignor to the Lunkenheimer Company, same place; steam boiler, F. G. and F. H. Bates, Philadelphia; steel construction, H. C. Clark, Bellevue, Pa.; rotary engine, Charles Crook, Jr., Brooklyn, N. Y.; rotary fan or pump, S. C. Davidson, Bel- fast, Ireland; steam boiler furnace, J. J. Le Duc, Kerns, Minn.; copper smelting furnace George Mitchell, Los Angeles, Cal.; shovel forming die, Arthur Rogers, Barnesville, O.; draf apparatus for steam boiler furnaces, J. W. Stock Nottingham, England; apparatus for supplyin air to steam generator furnaces, Cornelius Voet Harlem, Netherlands; manufacture of seamle and weldless tubes or hollow bodies, B. F. Mc Tear, Rainhill, England.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c. pr.
100 lb. " ....35c. "	ton lots and over.......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots.......32c. pr.
100 lb. " ....33c. "	ton lots and over.......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots.......34c. pr.
100 lb. " ......36c. "	ton lots and over.......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr.
100 lb. " ....30c. "	ton lots and over.......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and ot sections in orders of not less than 1,000 pounds at a ti $1.00 per lb.; large orders special discount. Sawed squ or flat stripe, 75 cents per lb.

Aluminum Bronze Paint, $1.26 per lb., in small lots; of 100 pounds, $1.10 per lb.: special price on large lots.

GAS AND GASOLINE ENGINE IGNITION.

BY ALBERT STRITMATTER.

IN the operation of a gas engine if there is any one thing which causes more trouble than another, it is probably the igniter. All successful gas engines are now operated upon the principle of ignition of the explosive mixture under compression and at a certain point to give the greatest power possible. An engine may be a perfect running machine with the exception of the igniting mechanism, but if this fails the whole thing is as good as nothing. Few people, in buying gas engines, know very much about them or at least enough to determine for themselves the weak or good points of the various makes and types. They often, therefore, are led to purchase an engine which has not an effective igniter and the result is perpetual trouble and dissatisfaction. This is probably the most vital part of a gas or gasoline engine, for if it is not effective the engine is no better than so much scrap iron. An engine may have a poor compression, but if the igniter operates it will give a little power. Or an engine may have poor exhaust, either in the exhaust valve or port, or in the external arrangements of the exhaust pipe, etc. Still there is a little power developed if the ignition takes place. But if everything else is in "apple pie" order and the ignition is not made properly and regularly there can be no results whatever.

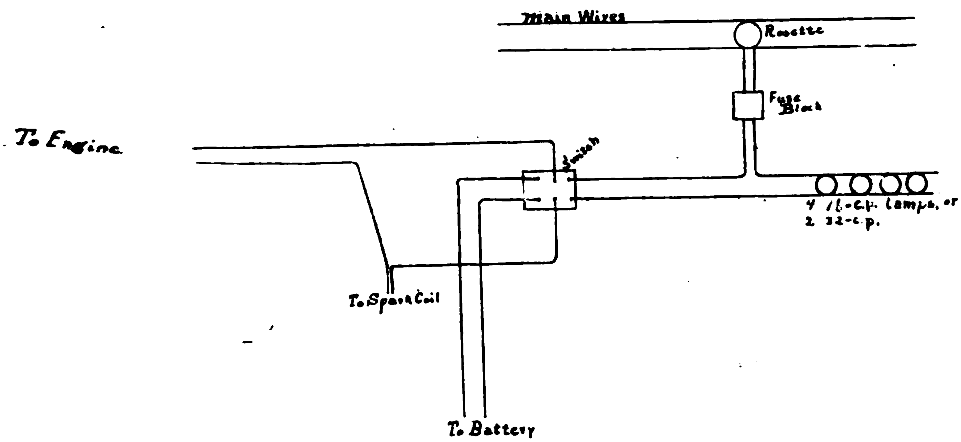


DIAGRAM FOR IGNITION.

In considering this question let us first consider the different methods of ignition. Perhaps more time and money has been expended by experimenters in the struggle to perfect this mechanism than in almost any other part of the machine. And yet the methods that have proved successful have been so few that they can almost be counted on the fingers of one hand. There is one method which, while not a very satisfactory one, was put out on a very large number of engines a good many years ago and there are a great many of the engines still in use. At the head of the engine was a sliding block of steel or iron. In it was a small hole about one or one and a half cubic inches in size. This slide would pass over a gas pipe and the small hole would be filled with gas and air. It then passed back across the head of the engine and in doing so the pocket passed a lighted gas jet or pilot light which ignited the gas in the pocket. As the slide moved on the gas continued to burn and finally the pocket came to an opening which led into the cylinder. The device was so timed that this pocket of burning gas reached the opening leading to the cylinder at the end of the compression stroke thus causing ignition at that time. For various reasons this method of ignition proved unsatisfactory although, as before stated, there are still a great many of the old engines employing this system still in use.

One of the methods of ignition commonly used at this time is that by means of a hot tube. In this method a tube is placed on the engine and the explosive charge

is compressed into it during the compression stroke of the piston. At the proper time the charge is ignited by the heat of the tube, which is heated on the outside by means of a gasoline burner or gas jet. Several kinds of tubes are used, the most common, and at the same time the most unsatisfactory, being the ordinary iron tube made of black pipe of about 3/8 inch or 1/2 inch diameter, and closed at one end. Porcelain is also used. But probably the best substance for the purpose is a nickel steel.

The objection to this method of ignition is that it is affected by so many conditions which are not under the control of the operator and which vary from day to day, so that it is unreliable. The iron tubes oxidize and become scaled on the inside, delaying the ignition, and finally burst through, necessitating a new tube. Although the tubes cost but three or four cents a piece, the loss of time in putting in a new one is often considerable. Where the engine is so located that there is a draught of air to play on the burner which heats the tubes, the flame is continually blowing back and forth and the tube is not kept at the same heat. This makes the hot tube very unsatisfactory for portable use and where there is any danger from fire it is also unsatisfactory. Atmospheric changes continually occur and affect the time of the ignition, so that it is constantly varying. As the maximum pressure produced is in proportion to the compression, it is essential that ignition take place at the point of greatest compression and not after the piston has started to move forward and thus reduce the compression. The exact point of ignition with a hot tube can be told only by an indicator card which few people are prepared to take even once in a while, let alone every day, and then make the tube to suit the conditions. The result is that engines using this type of igniter use too much fuel a part of the time and a part of the time give less power than is possible, simply because the ignition is not taking place at the proper time and regularly.

But by far the most common method of gas engine ignition is by the use of electricity in some form or other. There are a number of plans of doing so. First, there is the "make and break" method. In this method two electrodes or arms are brought together on the inside of the cylinder. One of these is stationary and is insulated with mica or other substances. The other electrode is movable. The two are connected on the outside of the engine to a battery and spark coil. At the proper time on the compression stroke, the two points are separated and a spark jumps between them as they separate, making the ignition. In order that this method be successful the battery must be strong, the spark coil must be as short as possible and effective, the insulation of the stationary electrode must be perfect, and the igniter points must be free from carbon or rust which may partially or entirely insulate them. A large number of materials are used for the igniter points. Platinum is very common and is hard, but it is expensive and often honey-combs in short time, spattering the spark. German silver is often used, but it is soft. About as satisfactory a method as I know of is to use hard steel for both points, or German silver on the stationary electrode and hard steel on the movable. In Mexico where peculiar conditions of climate and fuel are met, one user reported that he secured the best result by using a steel point on the movable electrode and on the insulated electrode a point made of 75 per cent silver and 25 per cent copper.

Then, there is the "wipe spark" method. In this plan one of the electrodes usually consists of a flat steel spring which is rubbed slightly on the stationary electrode before separating from it and causing the spark. This rubbing motion is intended to keep the points free from rust or deposits of carbon. It is objectionable, however, on account of having a spring in the combustion space subjected to a very high temperature, which is likely to spoil the temper of the spring. The igniter points also wear very rapidly under the chaffing section.

The "jump spark" method is becoming more and more liked, especially with automobile manufacturers. The principal advantage of this method is that there are no moving parts inside the cylinder, but the "points" are placed stationary a short distance apart. The current is made and broken outside of the engine cylinder, causing a spark to jump across the two points. Its main objection is that carbon deposits on the points very rapidly, causing cleaning of them to be necessary very frequently.

Further, there is the method of using a sparking dynamo or magneto, or of taking current from an electrical generator which may be used for producing lights or running machinery. These are more or less similar but with the sparking dynamo it is necessary to use a battery in order to start the engine. But after the engine is in motion the battery can be cut out.

The method of connecting up to a general commerical currrent is not commonly understood and the sketch given herewith illustrates the method employed. As will be noted the wires are not connected up back of the lamps, in order to shunt the current through the lamps and reduce the voltage. It is best to use a battery with a double switch as indicated so that the battery can be used in case of a shutdown at the central plant. Or, in cases where the current is from a generator run by the engine it is necessary to have the battery in order to start the engine. Of course the battery is cut out after the engine is started, and it therefore lasts a long time without renewing.

Where a battery is used in any of the methods named, it must of course be only of the best. Automobile users find it convenient to use a sal ammoniac battery as the renewals can be secured at any drug store or a supply can easily be carried along. Still if the battery happens to need renewing on the road it is necessary to wait for the solution to cool and in preparing it one is subjected to certain amount of inconvenience, such is getting it on the clothing, etc. One enthusiast has to admit that in spite if the convenience the "stuff spoils his tan shoes."

For ordinary power purposes, however, the sal ammoniac battery does not answer. In the first place, it does not give strong enough a spark and, in the second place, runs down too soon. While the renewals cost but little, much valuable time is often wasted if the battery gives out unexpectedly.

Dry batteries are frequently used and with good results, especially for portable work. The difficulty with them seems to be that they are not standard. Sometimes one will give out in a few days while another taken from the same shipment and subjected to the same tests and given the same care will last for months. This is true to a certain extent of the liquid batteries also. I know of some of these which have been in constant use on small engines running at high speed and on full load, where the battery seems to be as strong as it was two years ago when put in. These are exceptional cases, however, and even the best battery cannot ordinarily be expected to last more than six to eight months under average usage. A battery may be compared to a bucket of water. If you take a drop out every second for ten hours a day and continue to do so every day, the water supply will not last as long as if you take out a drop but once every half minute for eight hours a day. In other words, if a battery is used day in and day out ten hours a day, it will deteriorate sooner than if run but seven or eight hours only two or three days a week. Small engines run at a higher speed than large sizes and therefore require more explosions per minute, so that they draw on the spark supply more than large engines. Engines on full load also require more explosions per minute than those on light load, i. e., in the "hit and miss" type. Therefore it will be seen that throttling engines (which take a charge continuously,) or hit and miss engines which operate the sparker continuously whether a charge is taken in or not, both run a battery down quicker than hit and miss engines which cut out the sparker when a charge is not being taken in and exploded. It is also seen that the amount of load on the hit and miss engine and the speed at which an engine is run affect the life of a battery.

In cold weather it often occurs that the operator does not know how cold a temperature a liquid battery will stand without freezing or being injured. The manufacturers of a make of battery which is very largely used for gas engine purposes state that the sealed liquid battery which they recommend for portable use will not stand as low temperature as the battery for stationary engines. The sealed battery, so they state, can be exposed to a temperature of zero F., without the solution congealing. The other battery, however, will stand as low as 15 to 20 degrees below zero without freezing. They state that "the available current from the battery diminishes as the temperature falls and this is especially noticeable below zero. This decrease in

current output is due to the increase in internal resistance which rises inversely as the temperature falls."

Having considered the various methods of ignition which are in common use, we shall now be able to take up in a later article some of the trouble met with by gas engine operators, and study the effects of derangement of the igniting mechanism which so vitally affects the operation of the engine and determines the success or failure of it.

Comparisons of Value in Minerals.

BECAUSE gold and silver are used for measuring as money the values of other national products, people are prone to consider their production as perhaps the most important of the mineral outputs of the country. In a certain sense this is true. But a comparison of some of our mineral industries as set forth by the United States Geological Survey in the "Mineral Resources of the United States, 1900," shows how small a part, relatively, the two precious metals play in adding to our national wealth.

Round numbers alone being used for convenience sake, it is found that the gold product was worth $79,000,000, and that the commercial value of the silver product was about $36,000,000, though the coining value was $74,000,000. As metals, then, the gold and silver were worth $115,000,000; as money they were worth $153,000,000. Now, the copper produced in 1900 was valued at $98,000,000, though the price decreased a cent and a half a pound as compared with 1899; the lead was valued at over $23,000,000, though the condition of the industry was not good; zinc was produced to the value of over $10,000,000, though it declined 28 per cent in value as compared with 1899. The copper, lead, and zinc products were worth more as metals, by $16,-000,000, than our gold and silver, as metals, in 1900. Again, the combined values of the production of abrasive materials, such as grindstones, garnets, and so on; of chemical materials, such as gypsum, phosphate rock, and others; of pigments, such as metallic paint, white lead, and so on; and of the miscellaneous metallic products, the whole aggregate amounting to about $52,000,000, show that they were worth less, as metals or metallic products, than the gold by about $27,000,000, and more than the silver, as a metal, by $16,000,000.

Further, the comparison of gold and silver with the structural materials produced —that is, with $48,000,000 of building stone, $96,000,000 worth of clay products and $13,000,000 of cements; $157,000,000 in all shows, that the structural materials exceed the gold and silver in value by $42,000,000, if the commercial value of silver is taken, and by $4,000,000, even if silver is taken at its coining value of $74,000,000.

Applied now to the great metallic basis of our civilization, iron and its products, the comparison becomes still more striking. Iron ore was produced to within less than $9,000,000 of the value of the gold; and pig iron was produced to a value of nearly $107,000,000 in exceess of the coining value of both gold and silver combined. But the comparison of the gold and silver output with the output of the mineral fuels, coal, petroleum, and natural gas, is the most striking of all; for the combined gold and silver value is exceeded by the huge sum of $253,000,000, or $406,000,000 against $153,-000,000.

These comparisons are the more interesting in view of the statements of the directors of the mint that "two-thirds of the output of silver in the United States is obtained as a by-product from mines which would be operated no matter what the price of silver might be." and that in Cripple Crreek district ~~the~~ "reserves (of gold) in sight are enormous."

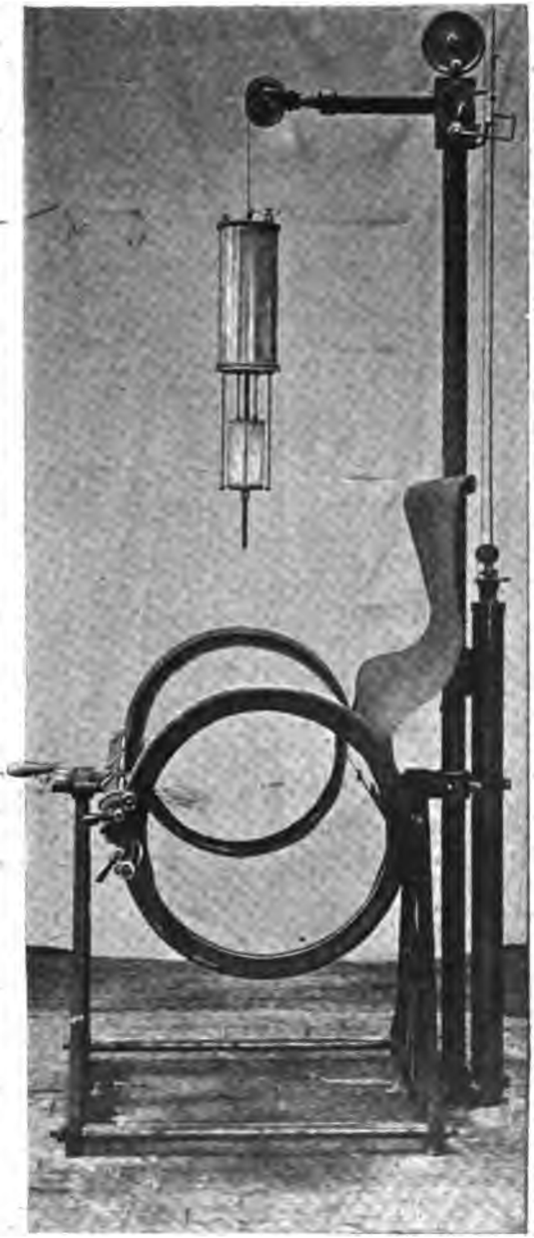
Another popular prepossession that receives scant courtesy at the hands of the report is in regard to tin. Besides the terse statement under the tabular summary, "Tin-Quantity-None," tin is only mentioned twice in the volume: once under the iron and steel statistics, when the productions of tin plates and terne plates to the amount of 302,665 long tons is noted; and again a brief description is given of the "Occurrence of Stream Tin in the York Region, Alaska," the York region lying West of Cape Nome. We produced no tin in this country in 1900.

Electric Blue Print Machiue.

THE accompanying illustrations show a simple, but efficient electrical device for making blue prints or photographs indoors at any time entirely independent of sunlight. The machine is self-contained and is more economical than any other apparatus on the market. An expert is not required to erect and all machines are tested and adjusted before leaving the factory, ready to operate.

The apparatus consists of a transparent cylinder, rotatably mounted in a portable frame, having means whereby the cylinder may be locked in either a vertical or horizontal position. The lamp is suspended by means of a standard with horizontal arm, this standard being fastened to the extension of the portable frame. The lamp or light acting as a counter-balance to the piston is gradually lowered by being attached to the piston rod, which is provided with a valve, for the purpose of regulating the downward speed of the lamp, thereby getting perfect regulation for any print that the user may determine to make. The range of speed can be adjusted anywhere between five seconds and twenty minutes, depending on the degree of sensitiveness of the blue print paper used.

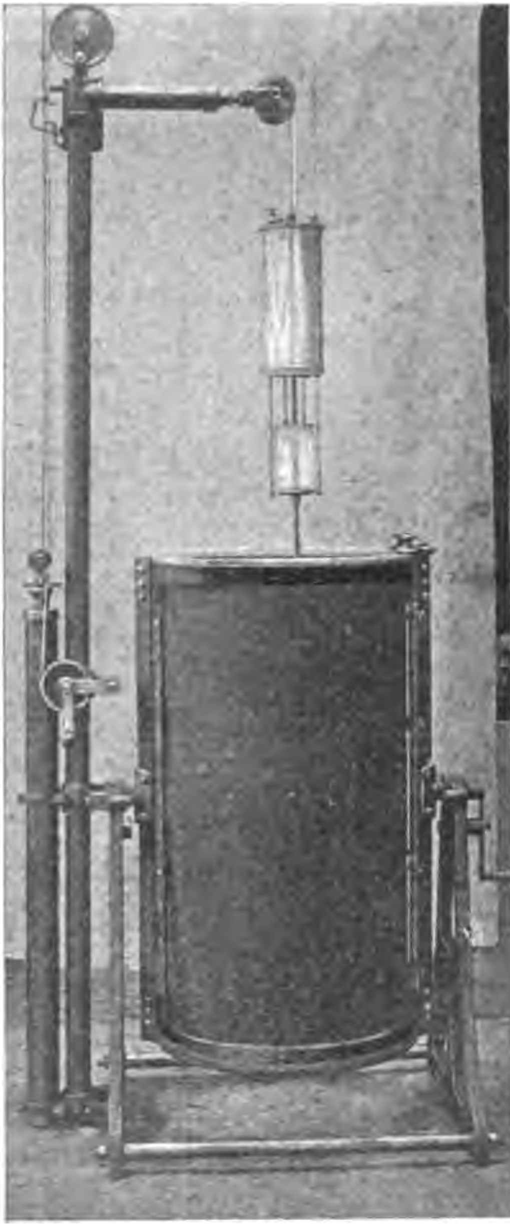
When the lamp or light has reached its maximum downward movement, the supply of current is automatically cut off, and the automatic "cut out" is held in this position until the lamp is returned to its normal position, and may be "cut in" any point whereto the lamp may have been lowered by the operator.



Ready to Receive the Paper..

To operate the machine the cylinder is locked in a horizontal position and the tracing and blue print paper placed on the outside of the glass cylinder; the canvas, seen folding against the upright post, is placed over the paper and all drawn taut by means of the crank handle rotating one of the shafts, providing perfect contact. The cylinder is then returned

to the opposite horizontal position to load the other half of the machine and then returned and locked in vertical position. The electric current is then turned on by means of the handle attached to the rod controlling the automatic switch, starting the lamp downward through the center of the cylinder by raising the windlass. When the paper is sufficiently exposed the lamp is returned to its normal position and the cylinder unloaded. The machine thus prints two prints at the same exposure the size ranging from 30 x 42 to 42 x 84 inches each. That is, the size given for each machine represents only one half the actual printing surface.



Blue Print Machine Ready for Exposure.

State Aid to Manufacturers.

INSTEAD of making an elaborate display of live stock, agricultural, horticultural and dairy products at the coming World's Fair, St. Louis, it is probable that several of the Eastern states will give prominence to their manufacturing industries. All the Eastern states depend largely upon the West and South for their markets, either directly or through jobbing houses, and it is considered to be in the line of good business policy to exploit that which will bring the greatest benefit to the state. To what extent the state may properly extend its aid to private individuals or concerns engaged in manufacture is a question that will be much discussed. It is possible that a solution may be found in providing the installation for exhibits of manufactured products and possibly in bearing the expense of transportation. This plan would leave to the manufacturer the expense of providing and maintaining the exhibit. No charge will be made for exhibit space.

The cost of installation is the greatest hindrance to a general representation of manufactured products at an exposition, and it is clearly to the advantage of any city or town to have its industries well represented at an exposition of such magnitude and importance as the World's Fair, St. Louis. The manufacturing industries of Eastern towns are depended upon to employ the available labor of each town and to produce articles of usefulness to be sold in distant markets. Money is thus brough

back to the community to offset the constant outlay for goods not produced in that particular community. The community is thereby maintained in a healthy condition so far as its commercial life is concerned, and the farmers find each prosperous manufacturing center a profitable market in which to dispose of their products. It is therefore highly important in any manufacturing community or comonwealth that the various industries be maintained in the highest degree of prosperity, for all citizens then receive their due share of benefits.

It is upon this theory that those interested in the representation of various Eastern states are proceeding, and it will be due to this departure from precedent that there will be an extraodinary display of manufactures from the East. The states of the Mississippi valley will show both manufactures and products of the farm and mine, while the states of the South and West will display extensively their live stock, agricultural, forest and mineral products.

Hardening the Face of Castings.

MORGAN A. PERRIGO, of Wilkesbarre, Pa., has discovered and patented a process for hardening the face of metal castings, his discovery, however, being more intended for use in the production of axle boxes used in vehicle construction.

The end sought to be attained by founders who make a specialty of the manufacture of this class of articles is the production of an inexpensive axle-box which will have the requisite strength. Heretofore high-grade boxes have been wrought, because great tensile strength can be attained in wrought forms. This method is costly, however, and many boxes have been produced from ordinary gray-iron castings. These latter, while being comparatively inexpensive are proportionately fragile and the metal is so soft as to be quickly worn out. These cast-iron boxes, as well as others made of malleable iron, have been case-hardened in an effort to produce a high-grade box at slight expense; but the result has been to render the metal exceedingly brittle and to lack that degree of homogenity essential in this connection. High-grade steel has likewise been employed; but the excessive brittleness of this material, due to the large percentage of carbon, has precluded its use. The inventor has produced an axle-box from a casting, minimizing the expense and producing a homogenous texture throughout the box.

He first produces the sand mold, after which he forms a core of either dry or green sand, which he impregnates with pulverized sulphur in such proportions as may be necessary to produce the desired density of the more or less extended surface to be cast or molded in contact with the core thus treated. The impregnation of the core is effected by mixing a suitable quantity of pulverized sulphur with the sand, after which the sand is reduced to a proper consistency by the addition of molasses water to facilitate the forming of the core. The core is permitted to stand for several hours and is finally placed in the flask. The metal is poured into the mold, the casting is made in the ordinary manner, and the resulting cast is found to have a comparatively deep facing of great density and susceptible of fine finish.

Petroleum as Disincrustant.

A useful hint regarding the employment of coal-oil for disincrusting boilers is given in our contemporary La Mecure Scientifique, by M. Marcel Guedras. He points out that it should not be used with boilers already coated with scale if external firing is used, for where a layer of deposits exists already the mineral oil penetrates its cores, reaching the plate, and, under the influence of continuous heat, the lighter portions are volatilized, while the heavier, during the progress of decomposition, swell, detaching the scale from the plate. In the case of external firing, since the carbonaceous deposit thus formed tends to rest on the hottest plates, overheating may result; in internally fired boilers, even if scales already exist before introducing the petroleum, this danger is not present. As regards the disincrusting process by means of petroleum as such, the oil—which is easily introduced with the feed through a sight-feed displacement lubricator, such as ordinarily used for cylinder lubrication—forms an emulsion inside the boiler which prevents the agglomeraton of the particles of lime, and, instead of their forming a hard deposit, they remain in the condition of a soft mud, easily washed out.

WHEN AN ARTICLE IS CONSIDERED SOLD.

BY EMANUEL T. BERGER.

CONCERNING the passing of title to a manufactured article as mentioned in a recent article on that subject there are certain exceptions. It would be an arbitrary rule of law which fixed upon contracting parties a construction to their agreement which was never their intention should be made, and so it has been held by a great number of courts that when the intention of the parties can clearly be shown to have been to create a certain state of facts, the court will respect such intention and construe the contract accordingly. Upon this subject the same can be said, where it is clear that the parties to a manufacturing contract intended that the title of certain goods to be made should pass before all the conditions incumbent upon the manufacturer are fulfilled, then their agreement will be construed in accordance with that intention, even though the law in the absence of such an agreement be entirely otherwise. The intention, however, must be clear, for unless it is decisively shown the unusual rule of law will prevail. The mere payment of installments on an article in process of manufacture will not show an intention to pass the title, not even where the buyer himself superintended its manufacture or furnished some of the materials. There must be an expressed stipulation that title is to pass at a certain time, then it will be so construed.

In a case decided in the state of Michigan only a few months ago, this point was raised and all the circumstances in connection with the transaction in question were taken together in order to ascertain the exact intention of the parties. Rules of law are not arbitrary things and are varied in many cases to suit the particular facts in each case and as there are never two cases just alike, the intention of the parties in the transaction must be taken into consideration in determining how far the usual principle of law shall apply. In the Michigan case there were certain New York lumber dealers and manufacturers whose agents resided in Michigan and through whom they did business in that state, J. & T. Charlton. The H. M. Tyler Lumber Company accepted an offer of the Charltons to sell them 2,250,000 feet of lumber at $15 per M. which lumber was to be piled upon the docks of the seller's agent at Sheboygan, Michigan, and it was agreed that the lumber was to be inspected by a man named Ritchie. The sellers piled the lumber upon the dock and marked it into lots but did not notify the dock owners of any change in the ownership of the lumber and continued in charge of the lumber as in the past; even the insurance of the lumber was in the name of the sellers nor was it changed after the lumber was placed upon the dock. Soon afterwards the Tyler Lumber Company took away about one-half million feet of the lumber after which an invoice was sent to them and they handed over a check for nearly $8,000 in payment. The Tyler people did not remove any more lumber within the time specified in their contract and the Chraltons notified them that they needed the dock space and wanted the lumber removed. The Tylers paid no attention to this demand but some time afterwards sent a tow to the dock where Ritchir the inspector made a demand upon the Charltons for the lumber which was refused. Upon his refusal the Tylers began suit and replevined the lumber and the case came up for trial in the Circuit Court. That court decided that the title had passed to the plaintiffs and that they were entitled to the lumber or the value thereof. Upon this decision the case was appealed to the Supreme Court. The principal question in the case was whether the lumber belonged to the Tylers or to the Charltons at the time that it was upon the dock and upon that question the Supreme Court said that whatever the rules of change of title in regard to the manufactured article may be, these rules must yield when there is an agreement clearly showing a contrary intention. In this case the court held that all the circumstances must be considered showing that the intention of both parties was that the Charltons were to own the lumber until it was inspected and carried away by the buyers. This inten-

tion was demonstrated by the fact that the dock holders were given no notice that the lumber had changed owners nor was the insurance policy changed. No representative or agent of the buyers was placed in charge of the lumber and they never paid anything upon it nor for any demand made payment except upon such portion as they actually carried away and reduced to their possession. The court held that the intention of the parties clearly was that the Charltons were to retain the ownership of the lumber and thereupon the Tylers were not permitted to recover.

In another case not quite so intricate it was similarly held. In that case it seems that one Max Braudy was in business in Grand Rapids, Mich., and dealt in iron rails, scrap-iron and metals. Messrs. J. Joseph & Brothers were a Cincinnati firm, dealers in the same materials. They agreed with Braudy to buy a certain number of tons of iron, horse-shoes, and a car of steel street rails and some steel of different grades, amounting in all to about $7,000. After the contract was made the iron was to be taken from the yards of the seller and placed f. o. b. cars Grand Rapids, and some of the material was to be f. o. b. to a point where the rate was equivalent to the contract price. Some correspondence took place between the parties and the seller refused to ship the goods. Upon his refusal the Joseph Brothers replevined the iron and were given a judgement by the Circuit Court entitling them to the property as it was held that the title to the iron had passed. The case was appealed to the Supreme Court of the State of Michigan. Upon a review of the facts it was argued that the amount of iron of the various qualities was not ascertained at the time the contract was made and could not be told until the iron was drawn from the cars and weighed. It was further said that the quality of the iron had also to be inspected according to the contract of the parties, and also that a certain portion of the iron was to be sent to a point not then determined and which the parties would not know until the rate of shipment was ascertained. The court held that in view of all these facts which clearly showed that it was the intention of the parties that the certain preliminary conditions were to be fulfilled before payment on the iron was made, therefore the title did not pass. The court further said that this was one of the cases on the border line between the question of just when the title to goods will and will not pass and that in cases of that character all the facts and circumstances in determining the intention of the parties must be taken into consideration and that when that intention was ascertained then the contract will be construed in accordance with it. The Supreme Court reversed the decision, entitling them to the return of the iron.

If in this case it had been definitely stated in the contract that the title was to pass at once upon the signing of the contract before the goods were shipped, inspected, weighed or set aside for the buyers, then the contract would have been construed in that way, but without such a definite statement in the contract the courts of law will always hold that, until certain preliminary conditions are fulfilled, from which it can be infered that the intention of the parties was that these conditions were to be fulfilled first, then no title will pass until everything has been done in accordance with the contract.

New Armor Plate Hardening Process.

AN important improvement in the manufacture or treatment of armor-plates has just been patented by Benton Knott Jamison, of Philadelphia, who has sold his entire interest to the National Steel Refining Company, of Wilmington, Delaware.

The invention consists of an improved and economical method of hardening the face of the plates to any required depth, so as to increase their resisting power and at the same time render them more tenacious and less liable to fracture, and then toughening the face of the hardened portion.

A steel plate is taken which is preferably of low-grade or mild open-hearth steel and heated slowly and gradually until it attains a bright-red heat and then with as

little delay as practicable, is immersed to a depth corresponding with the depth to which it is required to harden, in a cold bath of hardening liquid, or of such character that the contact of the heated metal and liquid bath will generate hydrocarbon gases, which will be absorbed or taken up by the metal. The time occupied in slowly heating the plate to a bright red as above described, will depend upon the thickness of the plate. For a plate six inches thick the time will be from three to four hours. The plate is left in this bath for a sufficient length of time to effect the hardening process—namely, until hydrocarbon gases cease to be generated from the bath and to be absorbed by the plate—the time depending upon the depth to which the hardening is to extend—say thirty to forty minutes for a depth of three inches—the bath is maintained as nearly as practicable at a uniform temperature during the whole time, so that the chemical properties of the liquid will be retained and the plate be gradually cooled. This temperature should be about the normal temperature of the water—say 60 degrees to 65 degrees Fahrenheit—for low-carbon steels—that is, steels containing not more than .50 per cent of carbon. For higher carbon steels containing more than .50 per cent carbon the temperature of the bath should be raised to about 70 degrees Fahenheit, before the plate is put in and be kept at that temperature. The maintenance of a practically uniform temperature may be best effected by admitting more cold hardening liquid through a regulated inlet to the lower part of the bath, providing the bath at the same time with one or more over-flow orifices, so that the level of the liquid in the bath, and therefore the depth of immersion of the plate, shall be kept uniform.

The effect of the treatment is that the portion of the plate which is immersed in the hardening liquid undergoes a molecular change from a granular to a fibrous condition, blending with the softer or untreated back portion of the plate, but leaving this backing or untreated portion in its original condition.

While the desired portion of the plate is being treated and hardened, it is preferable to place upon the non-submerged part or back of the plate a hot plate or several hot plates in succession, according to the thickness of the plate under treatment. The hot plate or plates should be treated to a greater heat than the plate under treatment, preferably to bright-red heat, which is a greater heat than that of the plate under treatment at the time the hot plate or plates are applied the plate under treatment being then at black heat. This has the effect of drawing a portion of the carbon from the back part of the plate and of annealing this portion, rendering it exceedingly tenacious and ductile and counteracting the tendency of the front portion of the plate to crack when it receives the impact of a heavy projectile. It has been found that in dealing with an armor-plate of six-inch thickness a good result is obtained by applying the first hot plate about four minutes after the armor-plate has been put in the bath, leaving it for about eleven minutes, then applying another hot plate and leaving this about sixteen minutes.

For the purpose of obtaining a plate of three different grades of steel the face of the front or hardened portion of the plate may be subsequently toughened by surface tempering in any suitable manner, as by raising to a suitable temperature and quickly cooling. For example, the surface to be toughened may be brought to a temperature of from 230 degrees to 300 degrees centigrade, in a furnace or by dipping into a bath of fusible metal or oil heated up to the requisite temperature, and then suddenly plunged into water at ordinary temperatures—say 16 degrees to 20 degrees centigrade. In this case a plate of three grades of steel so obtained, differing in their physical condition, but not in the chemical composition—namely, the surface which has been toughened by reheating to a low temperature and sudden cooling; the portion hardened by the action of the hardening-bath; and the remainder either in its original untreated condition or more or less annealed by the application of a hot plate or hot plates to the back, as described.

While any suitable bath liquid may be utilized for the treatment of plates in accordance with this invention, Mr. Jamison has also patented a bath that is preferably employed, and is composed of the following ingredients in the proportions named: sweet spirits of niter, (B. P.,) three ounces; aqua-ammonia, (specific gravity .88,) three ounces; chloride of ammonium, six unces; sulphate of zinc, three

ounces; ground alum, (best commercial,) ($Al_2 3SO_4 . Am_2 . SO_4 24H_2O.$,) three ounces; glycerine, eight ounces; water, one gallon.

A liquid composed of the same ingredients has already been proposed for hardening and refining steel; but the proportions have been different—that is to say, the proportions of chloride of ammonium and of glycerine have been considerably less—and it has been found by experiment that a good result is not attained unless the proportions of these two ingredients are as large as above given.

The order in which the ingredients of this hardening liquid are mixed and the time allowed to lapse between the additions of the several ingredients are important. First there is introduced into the water the ground alum and the sulphate of zinc' and then the mixture is allowed to stand for about twelve hours, or longer. There is then added the glycerine and afterward, as soon as practicable, the other ingredients. When all have been added and thoroughly mixed, it is desirable to allow the mixture to stand for about twenty-four hours before use.

There may be used merely a mixture of glycerine and water in the proportions of eight ounces of glycerine and one gallon of water; but while this last-named bath answers well and is found to be entirely practical it has also been found by experiment that the first-named ingredients and proportions are better adapted for the purpose.

It should be stated that either of the baths above described gives good results in the treatment of armor-plates of low grade steel, and in practice this process which should be understood as being distinguished from the process of tempering steel in oil, changes the nature, the physical structure, and molecular construction of the steel, whereas the tempering of the steel in oil simply tempers the steel more slowly than is done by tempering in water and other agents, leaving the steel less hard, but somewhat tougher than water-tempered material; and further, the changes caused by the oil-tempering process are merely temporary and do not change the physical and granular structure of the metal, and such changes of the metal caused thereby can be readily neutralized by re heating and allowing the metal to cool.

The plates treated according to this inventon can be re-heated, forged and re-forged without changing their nature, physical structure, or molecular construction.

The treatment of a plate when at proper temperature by this liquid causes that portion which is subjected to the bath to absorb a large quantity of hydrocarbon gas which has a strong affinity for the metal when the latter is in a heated state, thus facilitating this absorption, which has been shown to greatly improve the quality of the steel in its tensile strength and elasticity, and yet not deteriorate it in its capacity or ductility.

By many tests this process has been found to be especially adapted for the trea ment of armor-plates, since, when such a plate is composed entirely of low-grad nickel steel, it may be converted to a high-grade steel through a certain portion while the remainder is left in its original condition, and when the portion which is treated consists of a face of the plate and the treatment is permitted to extend to a considerable distance below the surface, a plate will be produced the face of which will have a greater resisting power than the highest grade nickel steel when untreated, while the back being low grade nickel-steel will prevent the cracking or shivering of the plate, as is well known in composite armor plates. To produce such a plate by this improvement it is only necessary to form it from low-grade or mild open-hearth steel, with say from .2 to .5 per cent carbon and an alloy of from one and one-half to five per cent of nickel bringing to the required temperature for the proper treatment of the plate and immersing a portion in the bath to the depth required to face-harden.

Although it has been mentioned that the per centage of nickel may be from one and one- half to five, experiments have shown the best results when the percentage of nickel has been three and one-fourth. If no nickel be employed, the percentage of carbon should be .55 to .65. A portion of manganese with or without nickel may also be employed—say .60 to .75 per cent—and the metal should contain as little silicon, sulphur, and phosphorus as practicable.

AMERICAN METHODS OF BY-PRODUCT COKE MAKING.

THE idea of manufacturing coke in retort ovens whereby the valuable chemical properties given off during the coking process can be utilized and turned to the uses of modern industry was first evolved in the coking fields of continental Europe. From there they were introduced into the coking fields of Great Britain and about ten years ago the exploitation of these economic ideas in this country was begun through the formation of American branches by the Semet-Solvay retort oven promoters and by the exponents of the Otto-Hoffman retort oven system. These two systems were the pioneers in retort coke making, but since the development of these systems a number of other retort coking methods have been evolved in foreign fields and these have also been exploited in this country. Among these by-product coking types may be mentioned the Coppee system which was perfected by E. Coppee, of Brussels and which employs vertical flues without regenerative firing; the Simon-Carve type which employs horizontal flues and thick walls; the Bernard system, the invention of a Frenchman, C. Bernard, which is built in small units with either vertical or horizontal flues; and the Bauer type which is used by the Krupps at their collieries in the Hanover coal fields of Germany. All of these systems had their development in continental Europe. The Newton-Chambers system is a type evolved by English coke experts and has also had some developments in this country.

For many years the coal and coke experts in this country have been giving the matter of by-product coke making considerable attention and the introduction of these foreign retort oven systems into the coking fields of this country resulted in the construction of a number of different by-product ovens on principles evolved by American enginers, who, by a close study of the conditions to be met in our coking fields hope to meet the requirements more fully than will be possible with the ovens evolved in foreign fields and built more especially to meet the specific requirements of coke making abroad. However, in most cases, owing to the exacting requirements of a retort oven in order to meet certain conditions, these American by-product coking systems have as yet not had any wide development, the inventors of the new systems perferring to await for results until there can be no question as to the merits of their respective systems. In consequence numerous experiments in by product coke oven construction have been conducted during the past decade in various American coking coal fields and in some instances results are as yet uncertain.

The manufacture of coke in retort ovens with the express purpose of covering the chemical constitutents given off during the coking process readily resolves itself into a complex chemical one and it has not been until comparatively recent years that America has been able to compete with Europe in this field. The vast resources of this country in coal has also operated against the rapid development of the more economical coke making systems while the comparatively limited coal areas of Europe has made necessary the strictest economy in all matters pertaining to industrial fuels.

It would seem that the most logical solution of the adoption of by-product coking ideas to the industry in this country would be to involve a by-product recovery system which could be applied to the bee-hive oven, and considerable work along this line has already been done. When the Solvay Process Company erected an experimental plant of twelve ovens at Syracuse, N. Y., and began the manufacture of coke in January, 1892, the attention of a number of American experts interested in the experiments was directed to that point, and the complete success of the experiments was largely due to the assistance of American genius. For a long time the late Joseph D. Weeks, of Pittsburg, Pa., had made a close study of the new coking systems, and among the others interested in them were Dr. F. S. Slocum, of Pittsburg, now connected with the Otto-Hoffman by-product plant of the Pittsburg Gas & Coke Com-

pany at Glassport, Pa., Dr. F. Schniewinf of the United Coke & Gas Company, of New York, John Fulton, coke and coal expert of the Cambria Steel Company at Johnstown, Pa., and R. M. Atwater, who for some years was connected with the exploitation of the Semet-Solvay by-product system in this country.

Both the Semet-Solvay and the Otto-Hoffman by-product systems have, in one or two instances, been adapted to the beehive oven, and two beehive oven plants in this country have been converted into modified types of the Newton-Chambers retort oven system. The Hemingway by-product system is an American type, the invention of Joseph Hemingway, and an experimental plant of this type has been installed by the Universal Fuel Company, at Chicago, for the coking of low grade Western coals. This system is adapted to the beehive oven and does not employ retorts nor use expensive changes in coke oven construction. It is simply an improvement on the ordinary beehive oven whereby non-coking coals can be coked and better results are obtained with coking coals. A blast is applied to the ovens through a simple blast furnace. The blast is driven into the oven by a fan. It passes through an accumulator thence into pipes entering the oven above the coal, the heated plates being largely deprived of free oxygen. In this system the coal is desulphurized by driving the hot blast through a layer of lime, and a coke containing only one half per cent of sulphur is produced. The promoters of this system contemplate the installation of a number of other plants.

Another American by-product coking system has been evolved by J. W. Keneval and is known as the Keneval process. An experimental battery of three ovens of this type is in operation at Knoxville, Tenn. The battery is 25 feet long, 24 feet, six inches wide, and 21 feet high, with ascension pipes and hydraulic pipes on the top. Ten tons of slack coal is charged into each of these ovens and coke equal to 75% of the charge is produced. John Fulton, the well known coal and coke expert, of the Cambria Steel Company, has for some time been at work on a by-product oven of a new type, as has Dr. F. S. Slocum, of the Pittsburg Gas & Coke Company, several of the Slocum retort ovens having been installed several years ago at Bolivar, Pa. This represents the development by American genius by-product coke oven progress up to date, and as will be seen, the matter of evolving a proper oven to suit the manufacture of by-product coke, and the utilization of the by-products of American coal is still in an experimental stage, the foreign systems which have been introduced having had a much wider development than the systems being evolved in this country.

New Electrical Winder.

FOR some time Benjamin G. Lamme, the well known inventor for the Westinghouse Electric & Manufacturing Company has been improving the winding for electrical machines, his aim being to provide a winding which may be readily applied to the core and also readily removed. Another patent has just been taken out for an important improvement in this line, the main object being to arrange the end conductors so that they may be readily and securely attached to the ends of bar conductors that are located in close proximity to each other.

The arrangement will be readily understood. The armature core is provided with partially closed and relatively deep slots, in each of which is located a short outer bar, and a long inner bar, each of which is provided with a sheathing of suitable insulating material. The teeth of each slot as compared with the width or thickness of the bars, may be different. The slots may be deep enough to permit an interposed insulating block or bar, or the bars may be separated solely by their insulating sheathings. Each end connector consists of two lengths of strap-copper of substantially the same form and dimensions, the ends of which are joined respectively to long and short bars in appropriate slots to provide the number of magnetic poles desired. It has been the usual practice heretofore, in constructing machines of this general character to fasten the end indicators to the bars by means of solder and rivets, it being necessary to make the attachment such that there will be no danger of separation. In case the core to which the winding is applied, has a large number of slots located close together, it is practically impossible to employ rivets, and therefore, the inventor proposes to separate the ends of the bar in each slot either by bending them or by reducing the terminals and securing the connections on opposite sides of the same.

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A Time For Care.

ASIDE from the general similarity in the operations in iron and steel between the present period and 1899, just after the dimensions of the revival in all the metal industries were fully recognized, there is another point to which the attention of producers should be directed promptly and from information at hand, a point to which attention has been directed. That is the possible, or probable, effects of the slowing up process later in the year when the enormous tonnage contracted for has been well removed from the books and yards of the steel finishing plants.

The slowing up of demand and active consumption immediately after a strong season of production is a matter of such uniform history in the iron and steel trades that it cannot be over-looked regardless of the crush of immediate business. The extra pressure of demand, as at present, prompts the producers to urge their capacity to the extreme limit and usually to the extent not only of utilizing to the extreme the living means of turning out needed material, but of adding to their equipment to cover the demand in the shortest possible time and incidentally to provide against a future movement of the same character. That has been done recently until the producers are getting directly in position to meet demand of almost any size. How far this position is capable of reaching out and how seriously affecting trade conditions may be estimated by a backward glance at periods less strenuously controlled by an active demand than the present.

It must be readily apparent that there are two sides to the question and one is just as serious and as imporant as the other. For a time the fear was general and not without reasonable foundation, that the effects of the gloomy iron and steel conditions prevalent in Great Britain and the continent of Europe generally would find their reflex in the United States. The American producers had just made inroads into the foreign markets and were making good sized shipments of material abroad at prices that met or discounted the best rates the British and other foreign producers could offer. The two causes that led to this movement as an international trade factor were the slowness of the demand at home and the excessive demand abroad. The foreign producers had not reached the point at which they were willing o prepare for such emergencies, and when the demand grew to extraordinary proportions they simply notified consumers that deliveries were impossible and told them to sit down and wait for material. Instead the consumers turned to the relatively dull American market and got what they needed so badly at lower prices than they could get at home regardless of the time of delivery. In this way a measure of relief was granted to the American producers while the extraordinary pressure was lifted from the shoulders of the British and continental manufacturers. Ultimately the foreign conditions went to the other extreme as they always have done and always will do and a depression of considerable extent, with distressing accompaniments, ensued.

That much is history, but is there nothing in those circumstances to outline the probable future conditions of our markets? The depression abroad not only checked the exportation of American products but actually opened the way for the importation of foreign raw material. This brings to light the negative side of the same question but a side which presents strong features. The improved demand at home working with an improved set of conditions abroad will keep the American products away from foreign markets as effectually as a prohibitive tariff. As the foreign manufacturers are rapidly equipping with better mechanical appliances the re-opening of the foreign markets to our producers will be more difficult

in the future. The slight falling off in consumptive demand last year showed how easily the American market becomes affected by over-production. The aggregate tonnage is so enormous that the faintest halting movement among consumers puts the producers on the defensive in grim earnest.

Not the least of the considerations to be scanned is that the demand that has overwhelmed the American markets today is not strictly legitimate to the day. That is to say, without the strike of the steel workers, and the strike of the railroad employes. added to the shortage in cars and motive power all coming together, the markets would not be in the present congested condition. The demand for material does not come from straight current needs but is the result of accumulations of orders running back a good portion of a year. There is no cause for alarm in anything visible but there is every reason for the exercise of discretion.

The Mining Problem.

So long as there are coal miners and coal operators there can be no relief from the mining question. Both sides will no doubt continue to follow a precedent established when competition in the coal trade became acute enough to demand shrewd management, but a precedent that was established so long ago that it might be waived with advantage to the industry. The elimination of the procedure or reasons for the usual course of miners and operators need not be prejudicial to the claims now or at any other time, of either side.

The annual convention of the miners just closed at Indianapolis declared in favor of acting for an advance in wages, approximately or actually, of 10 per cent. The operators are said to favor a reduction in wages for the coming scale year. This seems to be somewhat of a difference of opinion among men who are well informed in the industry in which all are engaged. To an outsider there are all the distinctive features of a horse trade between swappers of the copper-faced and hardened type in the coal situation. It is superflous for each side to declare that the other is "making the usual bluff." That is self evident in any case where men engaged in the same industry, even as employer and employed, differ so widely in their claims. But it is so much a part of the coal trade that if the scale adjustments were conducted in any other form, the allied industries, and incidentally the people up the trees, would be deprived of considerable comedy. In the end the whole affair will be solemnly concluded without damage to either side, and coal will be more costly to the consumers.

The census bureau's preliminary report regarding iron and steel, blast furnaces' in the United States for 1900, as compared with 1890, follows: Number of establishments, 223, decrease 7 per cent; capital, $143,159,232. increase 11 per cent; wage earners. average number, 39,241, increase 17 per cent; total wages, $18,484,400, increase 27 per cent; miscellaneous expenses, $7,463,234, increase 18 per cent; cost of materials used, $131,503,655, increase 19 per cent; value of products, $206,756,557, increase, 42 per cent.

Consul Ravndal, of Beirut, says: More or less successful efforts have been made during the last few years to can Syrian fruit for export. Some eighteen months ago, a French concern opened a regular factory in Beirut for the canning and preserving of fruits and for the manufacture of sweets and confectionery. To take care of a part of the present year's fruit crop, some 5,000 tins were imported from Europe. It is evident that the industry is growing. The manager, with whom I recently had an interview, is desirous of getting tin plates from the United States, as the present arrangement for obtaining cans is very expensive. American manufacturers of tin plate are requested to address Messrs. C. Galihac Rosalt & Company, Societe Francaise de Confiserie, Beirut, Syria.

IN AND ABOUT PITTSBURG.

The Columbia Bridge Company is having plans prepared for the erection of a bar mill to adjoin its structural plant at Carnegie. The size of the mill has not been definitely decided upon but the output will probably be 150 tons a day of bars up to six inches in diameter, angles up to six inches, flats, T's, etc. By the association, as director of the company, of Thomas W. Fitch, president of the Pittbsurg Steel Shafting Company, the interests of the latter company are allied with those of the former and part of the product of the bar mill will be consumed in the manufacture of shafting. It is probable that the finishing department of the Pittsburg Steel Shafting Company will be removed to Carnegie. The capital stock of the Columbia Bridge Company has been increased from $100,000 to $300,000. The company has bought 27 acres at Carnegie, for a building site on which work will begin at once.

The Hunt Foundry & Machine Company has been incorporated with $100,000 capital stock. The new company is a consolidation of the Hunt Air Brake Company, and the Kensington Foundry, both of New Kensington, Pa. The company will increase the capacity of its machine shop and is having plans prepared for a foundry to be built on a plot adjoining the air brake plant, to be equipped with modern appliances, upon the completion of which the Kensington foundry will be abandoned. The products of the company at present are street car brakes, portable and stationary air compressors, and small refrigerating plants to which will be added iron and brass machinery castings. The company is composed of H. E. Hunt, George H. Clapp, W. J. Dain and others. Temporary offices have been opened in the Anchor Bank building, this city. Permanent offices will be located in the Frick building.

The Pittsburg Consolidated Coal & Brick Company has been incorporated with $150,000 capital stock by Pittsburg men for the purpose of developing coal and fire-clay lands in Pennsylvania, West Virginia and Maryland. The company is composed of C. E. Pool, of the Pool Coal & Coke Company, Anchor Bank building, Pittsburg; F. H. Gregg, Samuel Crosby and H. Barlow. The holdings of the company include 98 acres of fire clay and coal land at New Galilee, Beaver county, Pa., 436 acres of coal and timber land at Bayard, W. Va., and 936 acres of coal and timber land at Stoyes station, Maryland. At New Galilee, Pa., two mine openings have been made and work will be started in the near future on the tipples. An output of 500 tons a day will be provided for. The company will also build a fire brick plant at New Galilee to have a daily capacity of 100,000 brick. The temporary offices of the company are located in the Anchor Bank building, this city.

The plant of the Braddock Machine & Manufacturing Company, at Braddock was bought last week by A. R. Peacock, G. C. Shade and A. H. Eames, all of Carnegie Steel Company. A meeting of the buyers will be held this week to effect a permanent organization and outline plants for the operation of the plant. The works will be run independently of the Carnegie Steel Company and may be enlarged to include the manufacture of mine cars. The products at present comprise chilled and sand rolls, tin plate, sheet, rod and wire mill machinery and cast iron wheels for mine cars. The selection of a new name for the company is being considered. Mr. Peacock is president of the company; Mr. Shade vice president and general manager; and Mr. Eames secretary and treasurer.

The McClintic-Marshall Construction Company, of this city, was awarded the contract for structural work on the new plant to be built by the Standard Car Company, also of this city. The contract calls for 2,500 tons of material. The company is installing in its Rankin plant a complete set of electric reamers to be used on plate girder work for railways.

The Standard Steel Car Company has secured 250 acres near Beaver which will be connected with the Pittsburg & Lake Erie. The contract for the principal buildings has been awarded to the McClintic-Marshall Construction Company, of Pittsburg, and the material for them has been ordered.

The Doubleday-Hill Electric Company, this city, has completed its complement of machinery in the new winding and repair department, Arrott power building. The company has taken up the manufacture of switch-boards and is prepared to overhaul and put in shape everything in the electrical line.

Neal Brothers, owners of the Anchor rolling mill, South Side, are preparing to install a galvanizing plant in connection with their rolling mill. The plant will have a capacity of from 10 to 15 tons daily.

An application for a charter will be made February 7 by the American Construction Company of this city. The incorporators are Alexander Gordon, H. C. Miller, and F. M. Sullivan.

NOTES OF THE INDUSTRIES.

Vesuvius furnace, at Ironton, O., has been running almost continuously for the past two years, under the management of Col. George N. Gray and associates. It makes an average of eight tons of cold blast charcoal iron a day. The entire product is sold to two Pittsburg firms. The product is sold now until March, 1903, at an advance over last year's prices. The Vesuvius is the only cold blast charcoal furnace in Ohio, and there is only one other West of the Allegheny mountains, there being one in Tennessee. The iron is sold exclusively for making rolls.

The Panhandle shops of the Pennsylvania Company, Columbus, O., are to undergo many improvements and enlargements at an early date. A new coal wharf and ash pit, erecting shop, addition to the paint and machine shops, new power house, etc., are contemplated. The erecting shop will be 80x660 feet, equipped with two 75-ton electric traveling cranes. The addition to the machine shop will measure 61 feet in length. A central power house with electricity as motive power will supplant the two power houses now in use.

The Shenango Valley steel mill at New Castle, Pa., did not shut down February 1, but the plant will work on until early in the month of March when the new 10-ton converters will be installed. The change was decided upon because the material used in the construction of the new converters was delayed. The castings of the converters will weigh over 90,000 pounds. The converters are being made by the Pensylvania Engineering Works, New Castle.

The Empire Steel & Iron Company, of Catasauqua, Pa., has leased for a term of years the two furnaces known as the property of the Allentown Iron Company. Superintendent E. T. Clymer has already started the necessary repairs, and the first furnace will probably be in operation early in March. The Empire now has eight furnaces in blast. The stack at Macungie and one additional crane will be started this month.

The Massillon Iron & Steel Company, Massillon, O., is building a new power station at its works of about 750 horse power capacity. The contract for the engines has been awarded the Russell Engine Company, Massillon; generators to the Northern Electrical Manufacturing Company, Madison, Wis., and the boilers to the Erie City Iron Works, Erie, Pa.

J. E. & A. L. Pennock, Philadelphia, have been awarded the contract for the Philadelphia Pneumatic Tool Works, at Twenty-first and Lippincott streets. It will be a one story brick building with basement, and will measure 130 by 96 feet. There will also be a one-story brick boiler house, 22 feet front by 43 feet deep.

The Department of Public Works, Philadelphia, will invite bids for the erection of a series of buildings at the city's filteration plant, at Gardner's Point, on the Delaware river. There will be a one-story dynamo and engine room, measuring 30 by 60 feet; a three-story administration building, measuring 87 by 100 feet; a two-story machine shop, measuring 200 by 50 feet, and a one-story gate house, 60 by 137 feet. All the buildings will be of brick, and the cost of the entire operation will be about $250,000.

The West Virginia Central & Pittsburg Railroad Company has placed an order for hopper-bottom steel cars with the Cambria Steel Company, Johnstown, Pa. These cars will be of the Vanderbilt design, which is said to be superior to other patterns. Side trusses alone will sustain the load, so that there will be no undue strain on the underframing, to which couplings, air-brake rigging, and other fixtures are attached.

The Tudor Boiler Manufacturing Company, Cincinnati, O., recently received an order from the Norwood water works, Norwood, O., for two 500 horse power Lynn vertical water tube boilers. The company will also install a 300 horse power water tube boiler in the Emery steam plant, Cincinnati, and two 200 horse power water tube boilers for the Kansas City water works, Kansas City, Mo.

The annual meeting of the stockholders of the Acme Foundry Company, Cleveland, O., for the election of directors, and officers for the ensuing year was held recently. The board of directors immediately elected the following officers: L. G. Kraus, president; W. H. Schwartz, vice president; William Greenbau, secretary; and C. K. Sunshine, treasurer.

William McIntyre & Sons, Sharon, Pa., have been awarded the contract for building five open hearth furnaces, 12 gas producers and 6 annealing furnaces for the American Steel Casting Company, at Alliance, O. Work on the contract will be begun in about 10 days.

Turner, Vaughn & Taylor Company, Cuyahoga Falls, O., are proud of a new record made by their wire drawing machinery at the Belfont Iron Works Company's plant, Ironton, O., recently. In a 22-hour run, using 36 blocks, there were produced 155 tons of wire.

The National Iron & Wire Company, Cleveland, O., is building a new structural and bridge shop in conncetion with its present plant. This building will be steel frame, two stories high, 50 x 70 feet, and is already under construction.

Business has practically been suspended by the Youngstown Car Manufacturing Company, Haselton, O.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—The breaking out of the car shortage again has been a disappointment to the iron and steel men and complaints are as loud as ever. From the middle of last week up to the present the run of cars has been very poor both directions, to and from mills and furnaces. The raw materials are growing scarcer after everybody supposed they were as hard to get as it was possible. Pig irons and billets are commanding premiums although there is no strain on the blast furnaces for deliveries after the end of the first quarter. Considerable Bessemer has been sold for deliveries through the first half of the year but up to date the second half of the year has been left comparatively uncovered. The greatest pressure is of course upon the first quarter but if the ratio of demand is maintained the second quarter will be under the same congestion. This applies only to pig iron and to some extent to billets. The finished lines are in better position as to deliveries through the first half of the year. The smaller producers are caught in the web of unfortunate circumstances and with them the finished steel branches are as badly hampered as the raw materials. But the United States Steel Corporation is turning out all products to the extreme limit of capacity.

The pig iron situation is the most interesting of all, perhaps, from the fact that the merchant output has been and still is limited with premiums offering for small lots. Notwithstanding the pressure on production the furnacemen are not jacking up prices and only when impossible otherwise have the rates on Bessemer and other pig irons been advanced. Some carlots of Bessemer have been sold for more than $16.25 at valley furnace but the contract rate has not exceeded that price. For car lots, however, the price is anything the furnace men may ask. Mill iron is still held at $16.50, at Pittsburg, a strong price for that product.

Billets have again advanced above the $28 per ton line, and this week small lots have been disposed of for a minimum of $28.50, while some sales commanded as high as $30 for immediate shipment.

The meeting of the independent sheet makers in this city has not been productive. They are unable at this writing to see their way out of their dilemma so far as relates to securing another source of supply of raw material than the United States Steel Corportation.

Prices as a whole are unchanged but the feeling is that unless the strain is relieved soon rates all around may be advanced somewhat. Some Eastern structural mills have advanced prompt price on that material $4.00 per ton from $1.60to $1.80, full freight added to Pittsburg base but the other Eastern mills and all the Western plants continue to quote $1.60.

CURRENT QUOTATIONS:

Basic	$16 75		Splice bars	1 50	
Bessemer		17 00	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	16 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 60	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Grey Forge, Shn.	15 60		No. 1 wrought	15 50	
Bessemer billets		28 00	No. 1 cast	13 00	13 25
Open hearth	29 00	30 00	Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined.		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Bolts, iron, sq nut.	2 50		Sheets, 26	3 00	
Hex nuts	2 65		Sheets, 27	3 10	
Standard sections.	28 00		Sheets, 28	3 20	
Spikes	2 00				

PHILADELPHIA—Prices in the local pig iron market are almost anything that holders are disposed to name for the first quarter of the year, pretty stiff for the second quarter and steady to firm for the last two quarters. There is hardly any iron available for delivery during February and March, and very little for the three following months. The range of prices for the standard brands of Northern iron, tidewater delivery, is unchanged but with a tendency to move higher.

Steel billets continue very scarce. Some little business was done the past week for delivery covering the first half of the year at $30. It is said that some German and Canadian steel has been imported at from two to three dollars a ton less.

There is a very heavy demand for nearly all kinds of manufactured iron and steel and the market maintains a good tone. A considerable amount of new business was taken this week by the plate makers, but so much new plate capacity has come on the market in the last year that it takes an enormous tonnage to keep all the mills filled with work. Structural material continues very active, and the mills are absolutely unable to take care of all the business offered, even when premiums are bid. Prices of sheets are not so strong as they have been, but the call for material continues good. The bar trade does not show as great activity as other branches of the finished trade, but, taking everything into consideration, the mills are kept well employed.

The steel rail producers are not seeking business in competition with foreign companies. As a result much of the business recently offered has been passed. Standard sections continue to be quoted at $28 at mill.

CURRENT QUOTATIONS:

Foundry, 1	$18 00	18 50	Girder rails	32 00	32 50
Foundry, 2	1[illegible] 00	17 75	Angles, 3" & lr'gr		1 80
Gray Forge	16 00	16 50	Under 3-inch		1 90
Bessemer billets	29 00	30 00	T's 3" and larger		1 85
Open h'rth bil'ts	31 00	32 00	Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

NEW YORK—Each week enables makers of raw and finished iron to see their way more clearly to the end of 1902. Nearly all the business now doing is for the summer deliveries and later. Indeed, there is scarcely a blast furnace, steel rail mill, structural mill, bridge works, car works or locomotive works that can talk of anything earlier. There continues to be a persistent effort by manufacturers to hold prices level, and thus prolong indefinitely the great demand.

The question is daily heard, "How long is this demand going to keep up?" The answer is "What is going to stop it?" All admit that it must slacken some day, and bring new conditions into trade. But no one seems able to discern any sign of a let up, or name any good reason why a halt should come within one or two years.

Certainly prices of pig iron are not high enough to influence any one desiring to use it. They are 33 per cent lower than two years ago, and, considering cost of labor, ores and coke, are scarcely better for the furnaces than in the lean years. The small rise of $2 a ton that has taken place since last summer but little more than covers the rise in cost for the furnaces that buy their materials.

The changed attitude of English and German makers has attracted attention this week. The Germans appear to have made the turn sooner than was expected, and are advancing prices on a much heavier demand. In England there is a better feeling, more business and better prices. Latest English trade journals, curiously enough, affect incredulity of reports of trade prosperity over here. They can not believe that the "American Peril" is for the time removed, but apparently look for some smart Yankee trick to be disclosed when our artificial boom collapses.

The buying for the week, as stated, has been mainly for deliveries the last half. The quantities of foundry and basic pig taken have been large and at full prices.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$17 50	18 00	Angles	2 00	2 50
No. 2X fdy Jersey City	16 65	17 15	Tees	2 00	2 50
No. 2 plain Jer. C.	16 15	16 65	Zees	2 00	2 50
Sohn. 1 fdy N. Y.	16 75		Time deliveries, basis $1.75 for angles, beams and channels,		
No. 2 fdy N. Y.	16 00		Com. base, bars per 100 lbs	1 65	1 70
No. 3 fdy N. Y.	15 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	16 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
			T rails steel f o b c	16 50	17 50
Sheets, blue annealed, 10	2 70	2 80	No. 1 wro't scrap iron f o b cars	17 50	18 00
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 mach. scrap	13 50	14 50
Plates ¼ and heav	3 15		Old wrought pipe and tubes	13 00	14 00
Ship & tank plate, on dock	2 50	2 50	Old car wheels, f. o. b. cars	16 00	17 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old ham. car axl's f. o. b. cars	22 00	23 00
Beams and chan'ls 15-in & under	2 00	2 50	Wrought turnings deliv. at mill	11 50	12 00

CINCINNATI—The demand for pig-iron continues strong. There has not been a let-up in demand for a single day All kinds of material have been bought in large lots. There have been further heavy sales of basic, and a noticeable new feature is found in several large transactions for mill iron for delivery over the third and fourth quarters of the year. Up to date the bulk of the business that has been done has been for foundry, and basic irons. The danger that the consumer runs who postpones purchasing is that when he comes into the market he will not be able to get what he wants. Already a very large proportion of the best foundry irons has been sold for the last half of the year. It can not be questioned that present conditions in years past would have resulted in vastly higher prices than we are having at the present time. The market has been held steady, and level. The improvement in transportation facilities noted last week has been lost during the week just closing, occasioned by the severe rain and snow-storms that have prevailed generally.

Prices remain as quoted last week. Consumption is enormous. Production will be enormous, and the out-look is for as good a business this year as last.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$15 50	Steel hoops	1 95	2 50
South fdy. 2	14 75	15 00	Sheet, 26	3 50	
South. fdy. 3	14 25	14 50	Sheets, 27	3 35	3 85
South. fdy. 4	13 75	14 00	Sheets, 28	3 45	3 95
Grey forge	13 75	14 00	Angles, 3 to 6 in	1 75	2 50
Mottled	13 75	14 00	Angles, 1¼ to 2¼	1 75	2 50
Shn. 1, soft	15 25	15 50	Beams and Chanls 15 in and under	1 75	2 70
Shn 2, soft	14 75	15 00	I b'ms 18, 20 24 in	1 80	1 50
L. Superior, fdy. 1	17 25	17 50	Tees	1 75	1 85
L. Superior, 2	16 75	17 25	Z's	1 70	1 80
L. Sup'r char'l c w	19 25	19 75	1 wrought scrap	12 00	18 05
Hang'g r'k ccl, 1	20 50	21 50	Steel mlting stock gross ton	11 50	
Sohn ccl c w	19 25	19 75	No. 1 cast	11 00	
Jaksn cy. silv'y 1	16 75	17 52	Old iron rails g t'n	15 00	
St'l brs base hlf ex	1 75	1 90	Old car wheels	14 50	
Iron bars	1 75	1 90	Cast borings	5 00	
Flange plates	1 82	1 92	Turnings	5 50	
Tank steel	1 72	1 82			
Ordinary fire-box	1 92	1 97			
T rails	36 00				

CHICAGO—There is good buying of gray forge iron. One present inquiry is for 10,000 tons and several good sized lots have been placed recently for deliveries during the second quarter of the year. Some of this purchased iron is intended for puddling and some for castings. Foundry grades also are in good demand and the past week has been on the whole a little more than

The Metal Markets.

ONDON—Tin—£110 10s-£106 12s. Sales, 520 tons spot; 730 tons futures.

Copper—£56 15s-£49 17s 6d. Sales 3,600 tons spot; 9,400 tons futures.

Lead—£11 17.6d £10 16s 3d.

Spelter—£17 10s-£17.

NEW YORK—Tin—$24.60-$23.90.

Copper—Lake, $13.00-$11.50; electrolytic, $12.37½-$11.25; casting $12.00-$11.12½.

Lead—$4.10.

Spelter—$4.25-$4.15.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 05
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 25
Cut nails, less than car lots, retailers	2 35

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10 c
Copper, light bottoms	8 c
Heavy Composition	9 to 10½ c
Brass Turnings	6½
Heavy Brass	7 to 7½ c
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	$3.00
No. 1 Pewter	16

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 50
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs $4.75.

A Hardsome Calendar.

The Reese-Hammond Fire Brick Company, Bolivar, Pa., has just issued a very fine calendar entitled "Love's Dream." The work on this is artistic, being on the embossed order. The first of a series of "Indian' calanders has also made its appearance which is very striking. The Reese-Hammond Company has the reputation of giving "good goods" and the calendars are on a par with its manufactured product.

Work has begun on the plant of the American Foundry & Machine Company, at Ravenna, O., ecently incorporated at $200,000.

Marine Engineers' Wages.

The Marine Engineers' Beneficial Association has given out its schedule of wages, which will be presented to the vessel owners in due time. The schedule is about the same as that adopted at the Detroit meeting, the feature of it now being that the general organization at Washington has sanctioned the programme, and it will be put into effect. The scale is virtually the same as that which was in effect last year, with the possible exception that they have introduced an early schedule which was talked of before, but not included. The scale of wages makes the following provisions:

The steel steamers will have three classes, the first being all freighters over 2,100 tons; all package freighters over 1,800, and all passenger boats over 1,200 tons. The second class steel steamers include all boats not mentioned in the first class, except as to passenger boats which will range between 300 tons and 1,200 tons. The third class will include all freight boats not mentioned in first and second class and all passenger steamers under 300 tons. First class boats having water tube boilers are to have three engineers, two oilers, and a water tender when required, and all boats with other boilers will have two engineers and two oilers. All second class steel steamers having water bottom and auxiliary engines must have two engineers and two oilers, while those having steering engines and windlass engines only have two engineers and one oiler.

First class chief engineers are to get $150 per month, or $1,500 per year; first assistants $100 per month, and second assistants $75. Second class chief engineers are to get $125 per month, their first assistants $90 a month. Third class chief engineers are to have $105 per month, and their first assistants $75 a month. Second and third engineers have a yearly salary proportionate to monthly wages.

First-class wooden steamers shall be all over 1,200 gross tons, and all package freighters over 750 tons; second-class wooden vessels shall be all steamers under 1,200 and over 600; third-class, all over 200 and under 600; fourth-class, all not included in the above. First-class chief engineers are to get $125 per month or $1,350 per year, and their first assistants $90 per month; second-class chief engineers shall get $114 per month, or $1,100 per year, and their first assistants $84 per month. Third-class chief engineers shall have $105 per month, or $1,000 per year, and the first assistants $75 per month. The fourth-class chief engineers are to get $95 per month, or $900 a year, and the first assistant $65 per month. First and second assistants also have yearly salary clause.

Coke.

The improved conditions in the coke trade were interrupted last week by the snow storms. The Pittsburg and Western shipments were almost up to the high mark of the week previous but a snow blockade on the mountains delayed train movements and Eastern shipments were 259 cars short of the week previous. Operations in the region were limited because of the scarcity of cars.

With all the interruptions from car scarcity and snow storms, January made a good showing. Production was held back because of the immense piles of coke on the yards with the opening of the year, but the better car supply the last three weeks of the month pushed the shipments up to the highest notch ever reached.

Production for the month amounted to 986,875 tons. The shipments aggregated 48,699 cars, estimated at 1,106,866 tons. Compared to the month of January 1901 this was an increase in production of 96,643 tons and an increase in shipments of 212,330 tons. This rate of gain, if maintained through the year, would indicate a trade of nearly 15,000,000 tons for 1902.

The possibility of delayed shipments through the remainder of the winter months is having the effect of stiffening prices for short time deliveries. Quotations for future delivery remain at $2.25 to $2.50 per ton for furnace coke, but for quick delivery in small lots prices as high as $4.00 is being secured. Foundry coke is quoted at $2.50 to $2.75 per ton with much better prices offered where immediate shipments can be made.

A summary of the Connellsville region for the week shows 21,605 ovens in blast and 1,112 idle.

The following figures show the scope of operations.

Production for the week	223,976 tons.
" last week	223,231 tons.
Increase	745 tons.
Shipments—	
To Pittsburg and river points	3,820 cars.
To points West of Pittsburg	5,448 cars.
To points East of Everson	1,586 cars.
Total	10,854 cars.
Last week	11,113 cars.
Shipments in tons for week	241,501 tons.
" " " last week	248,486 tons.
Decrease	6,985 tons.
Masontown Field	
Shipments for week	650 cars.
" last week	588 cars.
Increase	62 cars.
Shipments in tons	16,900 tons.
" last week	15,288 tons.
Increase	1,612 tons.

Coke Prices.

Pittsburg—Furnace, $2.25@2.50. Foundry, $2.50@2.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.25@4.50
onega, $4.25.

Coal.

PITTSBURG—The interest of the trade lies principally this week in the outcome of the inter-state conference on the wage rate for the coming scale year. While the miners and operators are apparently far apart the feeling is that the difference is not so great as appears on the surface and that the question will be adjusted without actual trouble when both sides get down to the real issue. Cars are still at a premium and the local market is at a disadvantage with the prospect that as soon as the cars have become normal in supply the period of higher prices for coal will be at hand.

CLEVELAND—The attitude of the marine engineers and the ship owners seems to indicate that the season's coal carrying rates will be considerably above last season's cost for the same work. The boat owners are standing together almost as a unit for a better season's rate and even for wild tonnage, and the outlook is for higher costs all around.

CINCINNATI—A good buying movement is on in the coal market and stocks are by no means adequate for the heavy demand incident upon a continuance of the cold spell. Shipments by rail are coming in slowly. Comparatively heavy stocks on barges present the only means of relief to the situation, though the policy which has been adopted by several river shippers of holding coal at this point, destined for lower river points, with the object in view of keeping down stocks at those points to influence prices, may have a serious effect here.

CHICAGO—Frigid weather has for the present lost its ability to tighten the bituminous coal market, that is such cold weather as has recently prevailed. The supply of Western fuel is large and soft temperatures bring a decided inclination of prices to weaken. There remains a fair movement to West Virginia and Pennsylvania coal to the West but Hocking Valley coal is far short of the current wants and other fuels have to be substituted. The crippled state of the motive power on the Hocking Valley lines is the reputed cause. The Eastern companies are making active preparations for a heavier lake trade next season than ever before and dock matters seem to be arranging themselves in a way that denotes probable stability of quotations. Coke is more plentiful and premiums paid on spot stocks are dwindling.

West Virginia Notes.

The B. & O. will bridge the West Fork river at Lumberport and connect its Monongahela river railroad with the West Virignia Short line, providing an improved method of shipping coal to Pittsburg and the lakes. The B. & O. has bought 250 acres of land at New Martinsville, the terminus of the Short Line, and will install yards with 28 miles of track. The lower river and Southern coal will then be sent from Fairmont over the Short Line, this route being preferable to the main line of the B. & O. because of the small number of grades encountered. The company has begun the construction of tipples at New Martinsville.

The opening of a new coal field is presaged by the organizing of the Fairmont & Buckhannon railroad by New York, Baltimore and Fairmont men. A survey will be started through Marion, Harrison, Upshur, Barbour and Taylor counties. Connection with the B. & O. will be made at Fairmont.

R. M. Slack, of East Liverpool, has asked Clarksburg for a site for a large pottery; M. W. Ferris, of New Castle, wants ground for a similar purpose, and A. R. Morrison, of Kutztown, Pa., asks for location for a silk mill. Another glass concern represented by H. W. Foote, of New York city, is favorably considering a proposition to locate a $1,000,000, factory at the same town.

The American Car & Foundry Company, at Huntington, will build big construction shops with capacity for 1,000 stock cars. The present erecting shops will be used for manufacturing steel coal cars. The foundry and planing mill are to be enlarged and much new machinery installed.

Steps have been taken by the Wheeling, W. Va., Board of Trade which may result in the establishment of a wire fence plant in Wheeling. The Chandler Wire Fence Company, of Trenton, N. J., is seeking location to build a branch plant and efforts are being made to have it located in Wheeling.

After weeks of litigation the Howard Coal & Coke Company's property at Wilsonburg, has been sold to D. C. Williams, of Adamston, for $100,000. New machinery and modern haulage system will be installed.

Reports of interference by the B. & O. with the construction of the Fairmont & Clarksburg electric railway, are denied. The B. & O., it is asserted, does not want the property.

The product of the LaBelle Iron Company's new plant at Steubenville, O., is on the market. The company will retain its Wheeling works, despite reports to the contrary.

A company with $200,000, known as the Neff Improvement Company, has been formed at Bellaire, O., to build houses. It will expend its capital erecting dwellings.

The Wheeling Steel & Iron Company is putting finishing touches on its tube mills, at Benwood, erected within the past three years at a cost of over half a million.

The Wagner-Palmros Company, at Fairmont, has installed a plant to manufacture electric motors. Other mining machinery will be turned out eventually.

A representative of the Doolittle Glass Company, Pittsburg, is at Clarksburg looking for a location for a plant to make self-sealing jars.

The Suburban Brick Company, Wheeling, is adding to its capacity by building new drying kilns and putting in new machinery.

R. D. Potter is preparing to build a big coal plant at Hoggset field, near Reynoldsille, in Harrison county.

The Bijou Coal Company, capital $25,000, has been chartered by John A. Clark and others of Fairmont.

Improvements at Johnstown.

Johnstown stockholders in the Cambria Steel Company are enthusiastic over the receipt of the annual report of President Powell Stackhouse recently sent out. The report says that the comany's coking plant in Johnstown is to be enlarged, owing to the fact that it will cease to make coke at Connellsville after this year.

President Stackhouse says that it is estimated that 200 Otto-Hoffman by-product ovens will have to be built in Johnstown to replace the plant at Connellsville. He also says that the addition of another large blast furnace will be necessary to fully supply the steel making capacity of the works at Johnstown.

These improvements, with the new open-hearth plant, six 50-ton furnaces; a 134-inch plate mill; a large steel car plant recently put in full operation, and the assurance of President Stackhouse that the car plant is to be enlarged means much good for Johnstown.

From the Trade.

The Bessemer Coke Company, Pittsburg, has issued a complete blue print may of the Connellsville region showing the new operations in the Klondike district. Each coke plant in the entire district is shown on the map which is revised to date.

Pittsburg Items.

A company has been formed at Ellwood City, to be known as the Ellwood City Brick & Clay Company, the object of which is the manufacture of brick, tile, terra cotta, and other products that can be manufactured from stone, shale or clay. Thomas Dugan, A. C. Frey, H. D. L. Cunningham and H. M. Whittaker are among the parties interested in the plant. The works will be modernly equipped and the finest grade of brick will be made. The capacity of the plant will be about 50,000 bricks per day.

Plans are being prepared by Julian Kennedy, mechanical and consulting engineer of this city, for a merchant blast furnace to be built at Toledo, O., for Pickands, Mather & Company, of Cleveland. The furnace will be located on the Clark property on the Maumee river and will have a daily capacity of from 350 to 400 tons.

The annual meeting of the Keystone Driller Company was held in Beaver Falls, a few days ago at which David McAllister and H. H. George of Pittsburg were elected directors. R. M. Downie, J. G. Downie and J. D. McAnnis, of Beaver Falls comprise the balance of the board.

The Findlay Clay Pot Works, Washington, Pa., will be enlarged in the near future and the capacity doubled. The new addition will be used for the manufacture of tank blocks, furnace blocks and other like supplies.

The West End and South Side power station of the Pittsburg Railways Company are to be enlarged and new equipment installed to increase the present facilities which are inadequate.

S. Diescher & Sons, Hamilton building, are preparing the plans for the new plant of the Bradley Manufacturing Company which is to be located on Preble avenue, Allegheny.

John H. Miller, civil engineer, New Castle, is making the survey for the location of a new tile works to be erected at Wampum by Pittsburg and New Castle capitalists.

The Greensburg Foundry & Machine Company, Greensburg, Pa., has been incorporated with $10.000 capital stock.

Warren and Cleveland capital to the amount of $50,000 will be invested in brick and tile manufacturing plant to be erected at a point a short distance above Warren, O. The site for the location of the industry has been purchased. F. W. Aldrige, Warren, is one of the interested parties. Seven kilns will be built immediately. The company has secured a charter under the name of the Blackurn Brick & Tile Company.

Big Crane Order.

Pawling & Harnischfeger, Milwaukee, Wis., makers of electric cranes have obtained, so far as we know, the largest order ever placed by one company at one time for electric cranes. This lately was placed by the Allis-Chalmers Company, Edward P. Allis works, for the new factory building at West Allis and specifies thirty-five cranes ranging in capacity from 5 to 75 tons. The demand for electric cranes in these immense and moderns shops will be taken care of through this order.

In addition to this order, Pawling & Harnischfeger recently booked orders for forty-three electric cranes from other well-known firms, among which are the following:

The Aultman & Taylor Machinery Company, Mansfield, O., 10 ton; Hecla Portland Cement & Coal Company, West Bay City, Mich., three 15 ton; Holthoff Machinery Company, Cudahy, Wis., two 20 ton; La Belle Iron Works, Steubenville, O., 10 tons; McMyler Manufacturing Company, Cleveland, O., 10 ton; The Glamorgan Pipe & Foundry Company, Lynchburg, Va., 15 ton; Wheeling Steel & Iron Company, Wheeling, W. Va., 7 ton; The Lorain Steel Company, Johnstown, Pa., four 7 ton; Puget Sound Naval Station, Bremeron, Wash., 10 ton; Enterprise Manufacturing Company of Pennsylvania, Philadelphia, 3 ton; Baltimore Copper Smelting & Rolling Company, Baltimore, 5 ton; The Midvale Steel Company, Philadelphia, one 10 ton and two 5 ton jib; Grand Trunk Railway System, Portland, Me., two ton; C. W. Hunt Company, West New Brighton, N. Y., 2½ ton. John Bogart, New York, N. Y., 14 ton.

Technical Bodies.

At the meeting of the Foundrymen's Association of Philadelphia last evening, J. B. Rufe read a paper on "The Rufe Power Molding Machine For General Work." Mr. Rufe has had considerable experience in this line, and this is his new creation. Pictures or lantern slides of this machine were shown. W. H. Pfahler, of the Abram Cox Stove Company, and a member of the National Civic Federation made some timely remarks on the subject of labor and capital, and their connection with each other.

Indications point to the erection of a new coal machine at Ashtabula, O., by spring. Several acres of lake front property have recently been purchased. It is thought that the Lake Shore Railroad Company is the purchaser, and that the new coal machine will be for Pickands, Mather & Company, Cleveland, O.

Industrial Notes.

Many improvements to the Bessemer plant at Youngstown, O., have been decided upon by the Republic Iron & Steel Company. The steel plant is practically to be dismantled and rebuilt in its entirety, the new works to be double the size of the present mill. Among the other improvements will be the razing of the present 23-inch blooming mill and erecting a 40-inch mill, which will be propelled by a 54x66 inch return crank reversing blooming engine. The 5-ton converters will be replaced by 10-ton converters. The four cupolas will be enlarged and a new one added. A stripper in proportion is to be installed, the contract having been let. The heating furnaces will be enlarged to conform to the new blooming mill.

Two new world's records, one in the blast furnace department and one in point of production in finished material, have been made at the Ohio steel plant, Youngstown, O. No. 2 stack in January produced 19,645 tons, the largest output accomplished by any 600 ton furnace in the world. The mill proper also went beyond any previous month in its history and won for itself the world's record not only in its class of plants, but far beyond even larger mills. Here are the figures: Converting department, 68,572 tons, ingots; finished material, 56,680 tons large and small billets and tin bar. The breaking down of a Bessemer department engine Wednesday night caused the loss of about 1,000 tons of finished material which otherwise would have been added to the record.

The Ingersoll-Sergeant Drill Company, of Easton, Pa., has given up its option on the Glendon furnace site, owing to the effect of the freshet of about a month ago, and its representatives have been looking after other properties in that neighborhood on which to build an extensive plant.

Work on installing the new clam-shell ore unloading machines on the Pennsylvania Railroad docks at Ashtabula, O., has been started. The machines are being erected by Webster, Camp & Lane, of Akron, O. The docks on which the new machines will stand will be strenghtened by ew piling and new cribs.

The Canton Crucible Steel Company, Canton, O., which was reorganized a few months ago, is conducting an experimental plant which so far has proven satisfactory. The company will probably add largely to its capacity in the near future.

The Hecla Charcoal & Iron Company, Ironton, .., has been organized. The incorporators are . E. J. Bird, Jr., S. B. Steece, George W. Keye, Charles Lintner, F. J. Horschel and H. C. Kerr. The company will lease and operate the Hecla furnace.

Robert McAfee, Director of Department of Public Works, Allegheny, is receiving bids for furnishing and erecting two 750, one 350, and one 60 horse power multiple valve, cross compound engines; four 250 horse power water tube boilers; two 500 k. w. and one 250 k. w. two-phase alternating current, two 37½ k.w.d.c. generators; steam and water lines, etc.

Pennsylvania parties are said to have options on a large stretch of timber land in Tuskaloosa county, Ala. It is said to be their intention to build coal barges at Tuskaloosa, floating them down to Mobile and New Orleans and thence taking them up the Mississippi river to Pittsburg for use in the river coal business.

The Muscadine Mining Company has been organized at Anniston with T. W. Coleman, Jr., and Ross Blackman, of Anniston, and F. C. Mills and L. B. Miller, of Cleveland, O., as the stockholders. The capital stock is $100,000. The company will mine iron ore in Calhoun county, Ala.

The Woodward building in Birmingham is receiving $150,000 worth of steel beams and girders from the Carnegie works at Pittsburg. The new rail and structural mill of the Tennessee Company at Ensley will be the first in the South to make these shapes.

The open-hearth department of the Maryland Sheet & Steel Company, Cumberland, Md., will be put in operation this week. The company will operate one furnace for the present which will have a capacity of 18 tons per heat. There will be from 12 to 14 heats a week.

The new blast furnace of the Iroquois Iron Company, Ninety-fifth street and Calumet river, South Chicago, was blown in last week. The furnace has been completed for several months but operations were delayed by the scarcity of coke.

The Riverside Bridge Company, Wheeling, W. Va., has taken options on a strip of land with Ohio river frontage having in view the expansion of its business by the erection of a large structural plant.

The construction of a tin-plate factory at Kokomo, Ind., is among the possibilities of the near future. Elwood parties are said to be back of the proposed enterprise and a site near the new steel mill has been mentioned.

The Youngstown Steel Casting Company, Youngstown, O., will award the contracts for the buildings this week. Parts of the machinery and supplies are about to be closed for.

Brady Brothers, of Clarksburg, have made plans for a bridge across the Tygart's Valley river near Cecil, Taylor county, and will survey for a proposed railroad two miles long for John Clark and others of Fairmont, to tap a 4,000 acre coal field in Barbour and Taylor counties. The field will be opened by the Pleasants Creek Coal Mining Company, of which Mr. Clark is president.

Florida, Summerville and Charleston, S. C., Pinehurst and Asheville, N. C., and other winter resorts of the SUNNY SOUTHLAND best reached via SOUTHERN RAILWAY

From Washington, D. C., The Southern Railway owns and operates over 8,000 miles of road, and has out of Washington daily six fast through trains, composed of Pullman sleeping cars, dining cars and day coaches. Direct connection made at Washington with both morning and evening trains from Western New York and Pennsylvania. The Southern Railway is the route of the "Southern's Palm Limited" and the "Washingon & Southeastern Limited;" has most magnificent trains operated in the South, offering to the tourist and traveling public complete service and fast schedules. For full particulars, copies of Winter Homes and Battlefield folders, to Charleston Exposition, pamphlets, rates, schedule information, etc., call on nearest ticket agent, or write L. S. Brown general agent, Southern Railway, Washington, D. C.

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THE OHIO STEAM PUMP COMPANY, WALNUT STREET CANTON, OHIO

COCHRANE HEATERS.

Any man who takes the trouble to look into the question of the kind of a Feed-Water Heater he ought to install in his plant is certain to reach the conclusion, and very quickly, too, that a well-designed open heater can give "cards" and "spades" to any form of closed or pressure heater, if it is possible to take cylinder oil out of exhaust steam. He will make the decision for the following reasons.

The Open Heater, being operated at practically atmospheric pressure and not having to carry boiler pressure, will be free from the troubles that come from leaks, due to expansion and contraction strains The Open Heater saves and utilizes the heat in the exhaust condensed in heating the water. The Open Heater gives practically the full temperature of the exhaust The heating efficiency of the Open Heater is not interfered with by the deposit of scale within the heater. The heating capacity of the Open Heater is not limited by a certain number of square feet of heating surface. The Open Heater provides for purification by saving the condensed exhaust, live steam drips and returns from heating system—by giving large depositing and settling surface (trays and filter bed) and time for the impurities to settle—by driving off to the atmosphere gases which hold the carbonates in solution—by providing for the flushing off of the lighter impurities. The Open Heater can be arrangey for quick and easy cleaning without disturbing and pipe connections. The Open Heater can be made of cast iron, copper and brass, which metals do not corrode or rust out to the same extent as wrought iron or steel.

He will decide against the Closed Heater because it will not do these things, and because it presents no offsetting advantages.

Now, AS TO OIL: There are lots of Open Heaters that will not take the oil out. There is one that will—the COCHRANE HEATER—because it is equipped with a thoroughly capable and efficient oil separator—the COCHRANE OIL SEPARATOR. More than 4,000,000 H. P. of boilers are being protected from oil by these Cochrane Oil Separators. Every Cochrane Heater is equipped with a Cochrane Oil Separator. More than 1,000,000 H. P. of Cochrane Heaters are giving satisfaction.

Point by point, following through, you will find that the COCHRANE HEATER, is better designed and better built than any other Open Heater. Every function necessary to the complete and successful operation of an Open Heater is accomplished by the COCHRANE HEATER, in a common sense, mechanical way.

The cleanest, clearest cut guarantees—the best workmanship and materials—the most satisfactory results obtainable—these you get with the COCHRANE HEATER.

For further particulars, prices, Catalogue 2-H. etc..

Harrison Safety Boiler Works,

Manufacturers,

N. Seventeenth St., Philadelphia, Pa.

The Sheet Men's Meeting.

The independent steel sheet makers began the work of organization at the Hotel Lincoln Monday with a fair representation of interests exclusive of the American Sheet Steel Company. The concerns represented were the Allegheny Steel & Iron Company, Whitaker Iron Company, Laughlin Nail Company, Newport Rolling Mill Company, American Rolling Mill Company, Waukesha Sheet Steel Company, Youngstown Iron, Sheet & Tube Company, Niles Iron & Steel Company, Tuscarora Iron & Steel Company, Stark Rolling Mill Company, Berger Manufacturing Company, and Parkersburg Iron & Steel Company.

A. F. Baumgarten, vice-president of the Maryland Sheet & Steel Company presided. As stated last week the program includes methods for securing more stable supply of raw material; unity in action in treating with organized mill workers on wage questions; unity of action in treating for freight concessions, and securing representation on all sheet steel conferences where the entire trade is interested and which have heretofore been conducted by the American Sheet Steel Company alone. A permanent organization at this time seems out of the question.

Minnesota's Ore Output.

The lowest estimate of the probable shipments of iron ore from Minnesota this year are in the neighborhood of 13,000,000 tons. The estimates are divided into 6,000,000 tons from Two Harbors, 3,000,000 from Alouez Bay, and 4,000,000 from Duluth. It is all head of the lakes business, and all the ore is from St. Louis county, Minnesota. It is reported in iron mining circles that there are four mines in Northern Minnesota that will this year produce 1,000,000 tons or more of ore each. These are Fayal, Mountain Iron, Mahoning, and Stevenson. The first two mentioned have shipped more than that amount before. The Mahoning has been in shape to forward 1,0000,00 tons or more any season for several years. The Stevenson is the newest mine of the four mentioned. It began shipping late in the fall of 1900 and last season sprang into prominence as one of the big ones, forwarding 666,000 tons.

Marcus Hamilton, of Johnson City, Tenn., has filed a petition at Knoxville to have the Virginia Iron, Coal & Coke Company declared bankrupt. The company has been in the hands of receivers for some months.

The Reading Iron Company's blast furnace at Emaus, Pa., will resume this week.

Additional Industrial Notes.

The Macungie, (Pa.) furnace will be put into blast this week.

The old French Creek forge at St. Peters, P. O., Chester county, Pa., is being dismantled. It was built in 1872 and consisted of four fires and one hammer, having an annual capacity of 800 tons of charcoal blooms.

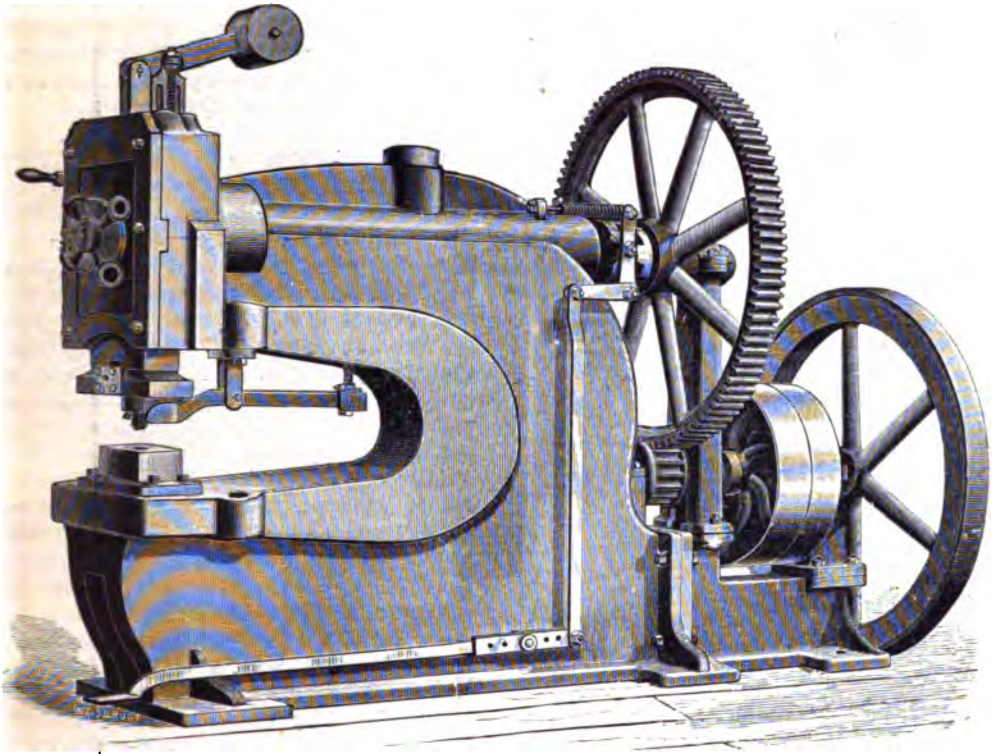
The Ensley Southern road is to be completed to Parrish in Walker county. A half dozen new mines have been opened on the new road and many others will be in a short time.

The Hannah blast furnace, of the Republic Iron & Steel Company, Youngstown, O., 16 foot bosh, made the splend'd record of 9,495 tons of Bessemer pig iron in the month of January, a daily average of 306 tons the day. The Hannah is managed by Bert Dietrick, who has been superintendent since the organization of the Republic company.

Sealed proposals will be received by the clerk of the village of South Brooklyn, O., until March 1, for furnishing the necessary labor and materials for the erection and equipment of an electric light plant and works.

Metal Working Machinery.

Punches, Shears, Rolls, and Doublers.



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Latest Coal Transactions.

The Somerset Coal Company, with a capital of $4,000,000, was organized in New York, January 31. The new company has taken possession of the following properties: Cumberland and Elk Lick Coal Company, Duncombe mine, Cumberland & Summit Coal Company, Althouse mines Allegheny and Pompheigh, Enterprise Coal Company; Casselman Coal Company, Listie Company, Pine Hill Coal Company, Stuart Coal Company, Tub Hill mine, Chapman mine, Milmoth mine, Thomas mine and Wilson Creek. These properties are all located on the Baltimore & Ohio railroad in Somerset county, Pa., and have an aggregate tonnage of 1,500,000 tons. The officers of the Somerset Company are C. W. Watson, president; J. T. Gardiner, vice president; and W. G. Sharp, treasurer. The general offices of the company will be in New York.

Charles T. O'Ferrall, Jr., of Roanoke, Va., has announced the organization of a company to operate all the fields on the Norfolk & Western railroad West of the Hackes fields. The new concern is known as the Pearl Coal Company, and Mr. O'Ferrall is general manager. The other officers are John A. Clark, of Fairmont, W. Va., president; J. E. Sands, of Fairmont, vice president; C. S. Sands, of Clarksburg, treasurer; and C. D. Junkins, of Fairmont, secretary. There are five operations under the management of the Pearl Coal Mining Company. They are the Pearl, the Camp Branch, the Freeport, the Olympia and the Union. The offices of the company will be at Dingess, W. Va.

The Virginia Pocahontas Coal Company has been organized and chartered at Bristol, Tenn. It will operate coal fields in Southwest Virignia and prepare for market iron, coal, stone, clay and timber. The capital will be increased from $25,000 to $500,000. T. P. Trigg, of Abingdon, Va., is president.

William Jobe, representing English capitalists, has 8,000 acres of undeveloped coal land 50 miles South of Charleston, W. Va., to mine coal to be shipped to the Northwest and the remainder to be exported to London and thence to Mediterranean ports. The new company will open two new mines, the capacity of which is expected to be 500 tons a day.

A coal deal was closed up at Washington, Pa., January 31, by which John H. Murdock and other Washington investors come into possession of several thousand acres of coal land in Cross Creek township. The land was optioned several months go at $65 per acre. The coal is nearly all in one block.

Patents.

The following patents granted January 28, 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa., from whom printed copies may be procrued for 15 cents each:

Gear cutter, E. G. Ashley, Rochester, N. Y. assignor to Sager Gear Company; coupler for rolling mill shafts, J. R. George and V. E. Edwards, Worcester Mass., assignors to the Morgan Construction Company, same place; mechanical stoker, T. N. Harrison, Middletown, O.; combined air and explosive engine, Robert Lundell, New York; process of forming floats for steam or water traps, W. F. Patton, Toledo, O; piston packing, T. G. Saxton, Lexington, Ky; ore separator, J. J. Snider, Xenia, O; furnace for heating ingots, V. E. Edwards and P. B. Morgan, Worcester, Mass., assignors to the Morgan Construction Company, same place; wire cutting die, R. A. Breul, Bridgeport, Conn.; lubricating apparatus, Henry Hamelle, Paris, France; steam boiler, B. A. Keller and R. D. Fildes, Chicago; lubricating steam turbines, A. C. E. Rateau and Gaston Sautter, Paris, France; production of solid materials from tar, Clemens Dorr, Germersheim, Germany; means for ejecting metal pigs from the molds, E. E. Slick, Braddock, Pa.; exhaust tube for steam engines, A. P. and Hinsdale Smith, Springfield, Mass.; fuel feeding attachment for furnaces, W. G. Stones, Blackburn, England; steam generators, G. H. Rhutan, San Francisco, (2).; locking device for glass molds, Albert Straub, Beaver Falls, Pa.; steam boiler, B. H. McDonald and G. G. Worthington, New York; explosive engine, W. J. Pugh, Davenport, Iowa; boiler feeding and cleaning attachment, Christian Reiser, Lake Charles, La.; gas engine governor, Andrew Sonander, Springfield, O., assignor to the Foos Gas Engine Company, same place; muffler for explosive engines, C. F. Weber, Albany, N. Y.; slide valve gear for engines, S. S. Younghusband, Darlington, England; roll polishing apparatus, D. R. Ferguson, Port Perry, Pa.; automatic regulator for marine engines, Daniel Mahoney, Brooklyn, N. Y.; fuel controller for steam boilers, H. K. Clover, Omaha, Nebr.; muffler for gasoline engines, G. L. Reenstierna, Winchester, Mass.; rotary engine, G. F. Sage Cleveland; free piston explosive engine, W. A. Swan, Providence, R. I.; fuel feeder for furnaces (re-issue), F. N. Spear, Los Angeles, Cal.; Compound Steam Engine, J. E. Sague, Schenectady, N. Y. (2).

A. G. Holt, of Kane, Pa., is seeking a location for a carbon and lamp-black manufactory at Fairmont.

INTERESTING EXHIBIT OF LAST YEAR'S PIG-IRON STATISTICS.

BY J. B. JOHNSTON.

FOR the first time in the history of the United States, the pig-iron output exceeded 15,000,000 tons in 1901. The statistical exhibit of the American Iron & Steel Association, prepared by Manager James M. Swank, one of the most reliable statisticians of the country on all matters pertaining to metal products, is just out, and it shows a total output of 15,878,354 gross tons, a gain, as compared with 1900, of 2,089,112 gross tons.

As in former years, and as was to be expected, the greater part of this increase is in iron of the Bessemer grade, the increase amounting to 1,653,341 gross tons as against an increase of only 376,474 in basic iron, notwithstanding the material increase of open-hearth furnaces during the year. Charcoal-pig production increased 30,273 gross tons, which indicates that the use of a high grade of special iron is required for many purposes in spite of the progress that has been and is being made in the manufacture of very soft and homogeneous grades of steel. Ferro-manganese and spiegeleisen increased from 255,977 tons in 1900 to 291,416 tons, an increase of 35,484 gross tons, substantially all of which was required in the manufacture of the increased tonnage of Bessemer steel.

Perhaps the most interesting exhibit made by these figures is the small amount of unsold pig-iron carried over at the end of the year. December 31,1900, the stocks unsold in the hands of makers, other than by concerns that manufacture for purposes of consumption, or stocks under their control, was 442,370 gross tons. On the same date 1901, the unsold stocks of all grades amounted to only 70,647 gross tons to which is to be added stocks in the hands of the American Pig Iron Storage Warrant Company 3,000 tons, making the entire unsold stocks 73,647 which evidences a market pretty well cleaned up at the end of a year of the most tremendous production.

Adding the yearly output, the stocks carried over into 1901 from 1900, making in all 16,320,724 gross tons, less the 73,647 tons unsold December 31, 1901, the apparent consumption was 16,247,077 gross tons. During the year, it is also to be noted, the exports were light as compared with the preceding year, so that it may be safely asserted that 1901 witnessed the most colossal consumption of pig-iron ever attained in a single year by any country at any time.

The number of furnaces in blast on the last day of 1901 was 266, which is a gain over the number in blast at a similar date in 1900 of 34.

A number of furnaces of tremendous capacity are expected to be fired early this year, a number that, in tonnage capacity, may be expected to exceed the tonnage output of those that, for purposes of repair or other cause, may be put out of blast, so that, stimulated by the present active demand, the tonnage output for the first half of the present year, at least, may be expected to exceed the first half of 1901, which was 7,674,613, the last half showing a gain over the first of 529,128 gross tons.

In connection with this favorable presentation of the achievements in one of the most prosperous years in the history of the nation, it is encouraging to receive at this time so cheering a forecast of the prospects for the current year as that given out in an authorized interview a few days ago by J. Pierpont Morgan, the financier of the United States Steel Corporation, and a man who is in position to be well informed, not only as to home enterprises and prospects, but whose agents abroad give him exceptional opportunities to estimate the situation and probabilities that may be expected to govern in Great Britain and on the continent of Europe, as well as in other parts of the world. Mr. Morgan is quoted as saying that the present high level of business is not at all unhealthful, not partaking of the characteristics of a "boom," but is a state of things due to unexampled developments of the resources of many lands, partly to a state of war and insurrection, but having primary factors in the marvelous development of a rudimentry knowledge of economy by those who

are at the head of governments, railways, ship companies and commerce generally. These primary factors are underlayed by the magnification of use of iron and steel, the closer association of nations in commerce, the greater rapidity with which the condition of markets, the prospects and probabilities at sources of production are ascertained through quick transmission of information to common centers. The world's increase of gold production, and credits has helped also. Consumption is higher on the unit of population, and improved methods of production have reduced the cost on the unit because of the great volume which is required. If war and insurrection continue for any time and the great projects for the increases of navies and shipping are pushed as contemplated, and all the numerous enterprises of an inland character that are projected and under way are carried forward, 1902 may show figures of increased tonnage of pig iron that will measurably surpass those of 1901 by as much as 1901 surpasses 1900.

The Growing Importance of Hoisting Machinery.

The increasing importance of hoisting machinery is evidenced by the number of new firms that have taken it up, and by the growth of the industry in the United States, France, Germany, and Belgium. Many firms now make a specialty of some type or types of cranes; others manufacture anything that offers. But outside of these there are firms doing other and an entirely different class of work who also undertake the construction of cranes of exceptional massiveness or for special purposes. There seem to be as many crane makers now in the United States and in Germany as in Great Britain, and though many of the German and French cranes have an outre appearance to us, and may certainly have weak points, that does not apply to all, perhaps not to the majority, and many are very excellent examples of this class of work.

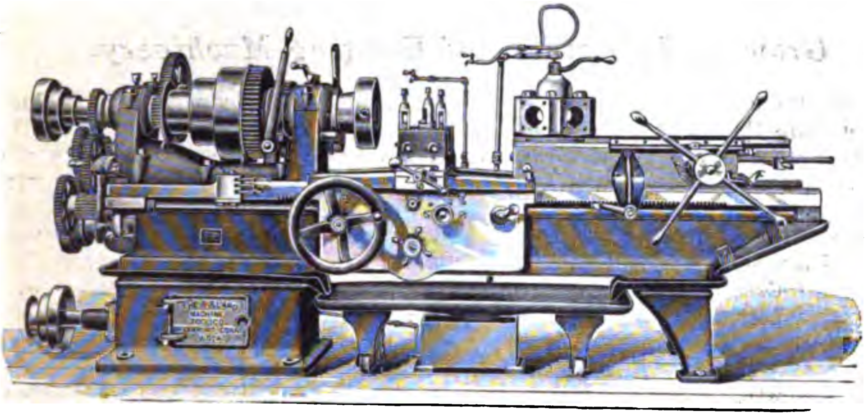
The growing importance of some classes of hoisting machinery is scarcely grasped by the older crane makers or users. Nearly all the older types of hoisting machinery are certain to be affected by the advent of the new, in which everything is reduced to the most slender proportions consistent with the actual strength required—steel sections, wire rope, and light trolleys taking the place of heavy castings, massive framings, rigid iron rods, and heavy crabs. The differences in dead loads and in speeds attained are great, and are wholly in favor of the new cranes. Add to this the fact that electric driving is adopted in these to a far greater extent than it is yet in the older, more solidly built types of cranes, and we have a set of conditions immensely in favor of the new. The differences are greater even than those between the modern electric traveler and the older square-shaft type, which it has so suddenly and almost completely displaced in new installations.

Great Britain is first in the field in the manufacture of hoisting machinery, and there it attained a high stage of development. When the Americans began to manufacture this class of machinery for themselves they started with no preconceived notions or prejudices, and American hoisting machinery is, therefore, different in many respects from British. Now under the circumstances just what might have been expected to occur—knowing the American character—has happened. Having a clean slate, they started to make machiney which should give the shortest cut to the results desired; hence the originality of many of their designs. And in machines which bear much resemblance to those made in Great Britain they have gone on more or less original lines in the working out of details.—Joseph Horner, in Cassier's Magazine for February.

MODERN GEAR CUTTING PLANT.

THE extensive use of cutting gears in recent mechanical contrivances has induced some concerns to make a specialty of this class of machining. Time was, and not so long ago, when gears were cut by every machinist for every special machine as well as the regular run of machinery, but this trade has gradually drifted to the specialists—gear cutters—mainly because of the superior equipment and wider experience in the manufacture of modern gears. One of the noticeable features in the development of the gear cutting industry was the substitution of cast steel gears for cast iron gears, and more recent practice is to substitute steel forged gears for cast steel gears. This product is adapted for traction cars, but its use will extend to other lines where strength is required.

The buildings formerly in use by the Westinghouse Electric & Machine Company, Garrison alley, Pittsburg, now occupied by the R. D. Nuttall Company,



Bullard Turret Machine.

contain a modern gear cutting works. Gear cutting is the specialty, although trolley poles, etc., are also made for electric traction motors and cars. The lower floor is used almost exclusively for gear cutting and is operated by two 125 horse power Westinghouse gas engines, triple cylinder, direct connected to electric generators. A 75 horse power steam boiler and engine is held in reserve but is seldom used. The gas engines are worked up to 140 horse power. The machinery receives its power from overhead shafting. The machines are not crowded and the building is well lighted.

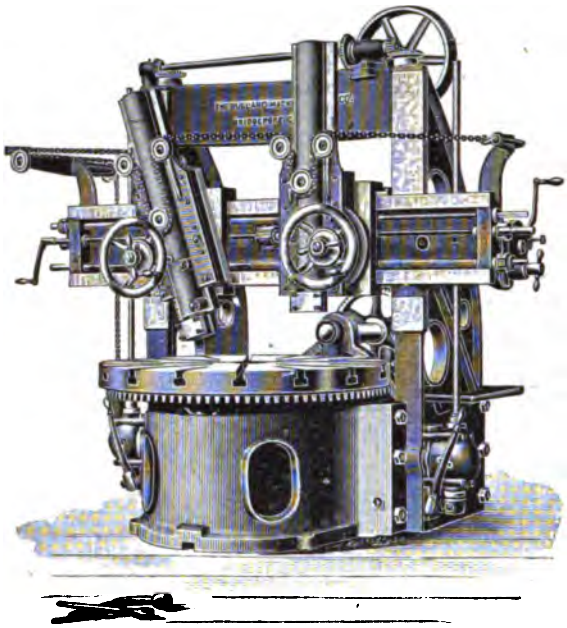
The latest enterprise, that of making forged gears, is simple, mechanically. Special shapes of rolled steel, shaped like channel iron, except that the extensions of the channel taper somewhat to the points, the channel two inches or more in thickness according to the depth of cutting for the teeth of the gears. The channels are cut into lengths by cold saws at the place of rolling. The lengths each make one-half of a circle. The channels are heated in a furnace to a bright cherry red, placed in an Ajax bulldozer and squeezed to the required arc of circle. The hub and arms are of cast steel and the ends of the arms are riveted to the channels of the pulley after it is bent into a circle. The arms and hub each make one-half of the shape and are bolted together. After the hub is bored out the shape is placed on a mandril and the gear turned down and faced. Only a light skin is taken off, as the surface of the forged channels show fewer irregularites than the cast steel gear shapes. The forged gear is cut the same as all others. They are said to be exceptionally strong, standing the tests of the largest electric motors yet built.

The company has in use a new 66-inch Gould & Eberhardt automatic machine for cutting spur gears only. Old-time gear cutters would scarcely believe the improvements that have been added to the gear cutters of recent date, nor the rapidity and accuracy with which they do their work. The Fellows' Gear Shaper Company has also installed a machine to cut internal and external gears that does some brilliant

work. During the last few months a machine has been installed by Gould & Eberhardt for coarse pitch gearing, and the Newton Machine Tool Company has installed one for cogging, worm wheels, ordinary and Hindley worm gear.

One powerful Bullard turret lathe is a new tool recently installed, and there are about 15 other lathes of various makes. A Betts 12-foot boring mill, a six foot boring mill and Bullard 36 inch boring mill with an old style Niles completes the boring mill out fit. There are 60 gear cutters and a number of planers used for the same purpose in cutting special gears. The Gleason Tool Company has installed a gear cutting planer that can be extended from 12 inches to 180 inches for spur gearing and will cut this on a 24 inch face. This machine has been used to cut gears 15 feet with a 25½ inch face.

The R. D. Nuttal Company has invaded the electric traction business to such an extent that the plant is divided into two departments, one exclusively for the cutting of gears for electric traction motors. As the size of electric motors increases the strength of the gears have to be increased. The other department is used for the making of special gears among which are gears for disappearing gun carriages, quite a number having been completed for the government. This work included racks, worm gears, worms and special sized and shaped gears.



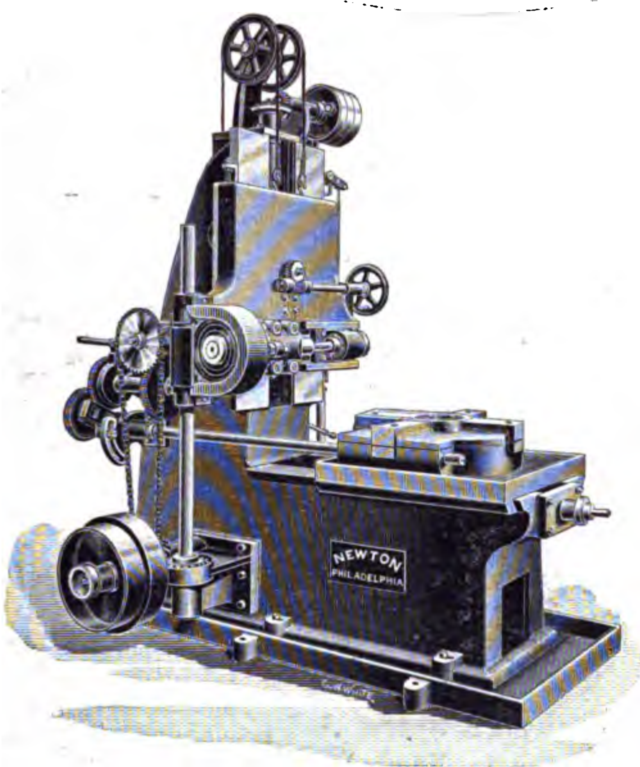
Bullard Boring Machine.

On the second floor of the building the Nuttal company make an assortment of trolley poles for electric traction cars, from the small pole used on mine motors to the long stretches for street cars. The plant includes a tool shop, blacksmith shop and pattern shop, the later being on the third floor, and a pattern storage room. Young as this organization is, it has made great strides in this special line of work and is one of the largest in that branch in the country.

Ship Building In 1901.

LLOYD'S register of British and foreign shipping, issues a report on shipbuilding, in the course of which it is stated that there have been built abroad during the year, 446 steamers, of 800,849 tons, and 453 sailing vessels, of 291,951 tons, in addition to 82 war vessels, of 255,000 tons' displacement. Among foreign countries the three leading places are held by the United States (433,000 tons), Germany, (218,000 tons), and France(177,000 tons). Of the mercantile tonnage reported from the United States a considerable proportion does not affect the general commerce of the world, being intended for service on the great lakes. As showing the size of vessels employed in that trade, it may be mentioned that 16 steamers have been built for it during 1901, of upwards of 4,000 tons each. On the coast 14 steamers of over 4,000 tons each, two steel sailing vessels each about 3,300 tons, and six wooden sailing vessels of over 2,000 tons each, have been launched in 1901. Germany has launched the following steamers of large tonnage—viz.: Kronprinz Wilhelm, 14,908 tons gross; Blucher, 1,2372 tons gross; Moltke, 12,372 tons gross. No very large

sailing vessels are included in the output of Germany during the year, but it may be noted that a steel five-masted ship 5,200 tons is being built on the Weser, under the survey of Lloyd's Register. In France, the construction of large steel sailing vessels has coninued to flourish under the influence of the bounties granted by the state. Forty-nine such vessels, of 2,000 tons and upwards, have been launched during the year under review. The largest of these is the Lon Blum, of about 3,200 tons, built near Rouen. Some expansion is noticeable in the construction of steamers in France, the output being 53,000 tons in 1901, as compared with only 20,000 tons in 1900. In Italy, the mercantile output of the year is 60.500 tons. There has been a considerable reduction in the tonnage on the stocks in Italy during the last two years. In December, 1899, the tonnage in hand amounted to 107,000 tons; in December, 1900, to 87,000 tons; it has since fallen to 61,000 tons. If to the figures for foreign countries we add those for the United Kingdom, the total output of the world during 1901 (exclusive of war-ships) appears to have been about 2,617,000 tons (2,302,000 steam, 315,000 sail). Lloyd's Register wreck returns show that the tonnage of all nationalities totally lost, broken up, etc., in the course of twelve months, amounts to about 746,000 tons (361,000 steam, 385,000 sail). It will be seen thus that, while the sailing tonnage of the world has been reduced by about 70,000 tons during 1901, the steam tonnage has been increased by about 1,941,000 tons. The net increase of the world's mercantile tonnage, is therefore, 1,871,000 tons. Compared with this net increase for the world, the net increase of 543,000 tons, as stated above, for the United Kingdom is equivalent to 29 per cent. In the net increase of the world's steam tonnage, viz., 1,941,000 tons, the United Kingdom has shared to the extent of 659,000 tons, or 34 per cent. Of the new tonnage launched during 1901, the United Kingdom counted for nearly 45 per cent.

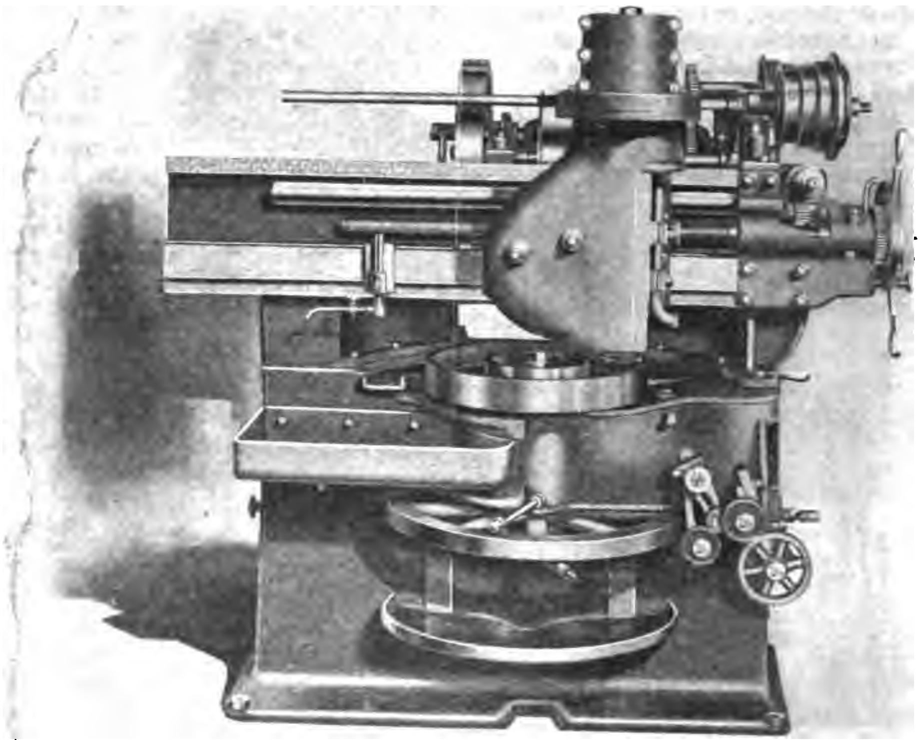


Newton Cogging and Worm Wheel Cutter.

Economical Smoke Preventer.

M. D'ALTOFF has invented a smoke-consuming device in which he utilizes the smoke to form a combustible gas which he calls "pyro-gas." The apparatus consists of a filter into which the smoke is driven by a ventilating fan. The filter is filled with porous material such as wood, tow, cotton, coke, etc., and over this is allowed to run a continuous stream of liquid hydro-carbon, petroleum, benzine, or alcohol. The result is that a gas is collected from the filter which is rich in carbides of hydrogen, especially ethylene, and thus has a great calorific power. It may

be used for heating or to drive gas engines. On the other hand, the filtering matter, which has stopped the soot and the heavy hydro-carbons, may be used as a combustible. In this way the smoke is suppressed and a great economy of combustion is secured. Several plants of this kind are said to have been installed at Brussels, and in one of



Fellows' Gear Cutter.

these the "pyro-gas" is used to heat the boiler of a 50 horse power steam engine. A plant at Malines uses the gas directly with a gas engine of 50 horse power, and several others are to be installed.—Scientific American.

GAS AND GASOLINE ENGINE IGNITION.

BY ALBERT STRITMATTER.

HAVING considered the more common methods of ignition of gas and gasoline engines we shall investigate some of the troubles encountered which may be suspected to be in the igniting mechanism. As a first essential to success in locating troubles with an igniter it is necessary to have a thorough and perfect understanding of the igniting mechanism and to tell whether any particular part is right or not. An operator who has just taken charge of an engine with which he is unfamiliar cannot be expected to know all or even very much about it, but if he is willing to study and learn he will be able in time to understand it thoroughly.

In the first place, however, it is necessary that the igniter be not blamed for faults not its own. Many an igniter is condemned when the fault is with the mixture of the fuel, or some other condition which contaminates the charge. The subject of mixtures has been considered but, briefly, may be re-stated as follows: For a charge to ignite it must contain the proper proportion of gas or gasoline to air. If too much gas or gasoline is supplied the mixture will be too rich to ignite, or, if it does ignite, to give a strong explosion. If too little gas or gasoline is supplied, the charge is too weak to ignite. An exhaust pipe too long or one with too many bends will cause back pressure of the burned gases into the cylinder, fouling the incoming charges and causing failure to ignite. An exhaust pipe which has a muffler with its perforations entirely or partially stopped up, with burned and gummy oil, causes the same trouble. In other words, anything which prevents a free and perfect escape of the burned and exhausted gases will cause failure to ignite.

But assuming that the mixture is all right and that the burned charges escape readily, if ignition does not take place the first thing to do ordinarily is to look at the battery, if one is used, and see whether a good, white spark is secured. Batteries sometimes give out very unexpectedly and one which gave a good, "fat" spark yesterday may not be doing so today. This may be because the switch was left in over night or the battery short circuited from the wires having crossed where the insulation may have been worn off. Or, if the battery has been in use a long time, it may have given completely out. The life of a battery is an uncertain quantity to a large extent. One man recently wrote to a manufacturer stating that his battery had been in use for a year and had not given out and he wished to know how much longer it might be expected to last. Another has had one in constant use over two years. Two batteries of the same make were sent out by a dealer some months ago and he watched them closely as he could. One gave out in two months; and the other at the end of six months was still doing good work and was working on a heavier load than the other ever had. Both received excellent care. The safest thing to do is to keep a set of renewals on hand so that if the battery gives out suddenly it can be renewed without waiting to send away for renewals and cause the engine to be shut down indefinitely.

Coming to the igniting mechanism proper, it is difficult to lay down definite rules which will apply to more than one particular make because each make of engine has its peculiar features in the igniter, which will cause troubles that would be met with in no other make of engine. In selecting an engine particular care should be taken to see that the igniter is easy of access and simple. There are engines the igniter of which cannot be taken apart without tearing off half the engine. In others, if one part of the mechanism wears slightly, the ignition immediately gets out of time and there is no means of adjustment provided, so that new parts must be purchased.

In those engines which ignite by bringing together two electrodes and then separating them, it is essential that the insulated electrode should be actually insulated. Mica, lava, asbestos and other substances are used to insulate these electrodes, but the insulation sometimes breaks. Sometimes the breaks are so small that they cannot be detected when the engine is cool, but after it gets hot and the parts expand the insulation can be plainly shown to be defective. To test this, attach one wire from the battery to the insulated electrode and with the other wire touch any part

of the engine, holding the igniter points apart. If, upon scratching the wire upon the engine, a spark is made, the insulation is broken and must be repaired. This usually has to be done at the factory. It is a good practice to keep on hand an extra igniter plate or flange, if the engine is so arranged. Then in case of trouble from any cause with the electrodes the extra plate can be put on while the first one is being repaired.

But if the insulation is good and no spark is made, perhaps one of the sparking points has become insulated. If these are not put in solidly, carbon sometimes deposits around them to such an extent as to cause partial insulation. Or, perhaps the points are loose, and do not come together. Possibly they do not get a contact because the mechanism operating the movable electrode does not allow it to come clear back after separation and give a good contact of the points. Perhaps the points are dirty or rusty, causing insulation by not making a good contact. Then, the mechanism must separate the points quickly, for a slow separation will not give a good spark. The spark coil must be kept dry in order to secure a good spark. One must also watch that the points do not wear down too far so that a contact is not made. This is especially to be watched in cases where the "wipe" spark method is used, as the wiping action tends to wear off the sparking points. The objection to the tube igniter is that the time of ignition cannot be fixed exactly. The ignition must take place, to give the greatest power, sufficiently before the crank reaches the back dead center to cause the greatest pressure just as the crank passes the dead center. This is easily determined by an indicator and when once shown, the manufacturers generally make an explanation in their instructions how to locate it. If the ignition takes place too soon the explosion occurs against the piston before the completion of the compression stroke and thus tends to reverse the engine. The energy stored up in the flywheels, however, causes the engine to continue in the same direction past the dead center, but the force of the explosion is greatly reduced. These premature ignitions cause the engine crank shafts to break by causing a slight check or crack to start and continually increase in depth until the crank finally breaks off. In many cases the jar on the hub of the fly-wheel cracks it, and the key-way in both the wheel and the crank shaft is greatly enlarged.

(To be Continued.)

Foreign Coal Shipment.

ROBERT P. SKINNER, American Consel-general at Marseilles, France, gives some information in detail on the subject of heavy transportation of coal from Great Britain and America to France, for the purpose of demonstrating the propriety of building special coal-carrying steamers. He says substantially;

In the actual condition of the carrying trade, the complaint of all owners is that the business is being done on unprofitable terms, if not with absolute loss to themselves; 5s. 6d equal to 7 francs, or $1.35 per ton from Cardiff to this city is at this writing a high price. More charters are being written at $1.20, and they hover between the two extremes. From Baltimore or Newport News to Marseilles, the present price is fairly firm at 9s. ($2.25), and the difference between these rates is $1.10. Hardly more than a year ago, the difference between coal rates from Baltimore and from Cardiff to Marseilles ranged from $2 to $2.30. While the depreciation in freight rates is very generally explained by the release of tonnage heretofore required by the British Government for war operations, the superabundance of new tonnage and the large number of ships contracted for and in process of construction, the change in the relative difference between the rates from Cardiff and Baltimore to the Mediterranean is attributed to special conditions. It is pretended that a very large number of steamers have recently gone to the United States for grain or cotton which have not been offered for shipment, and that these ships have therefore been forced to take what they could get in the way of cargo, upon any terms, with the result that the relative difference between American and British coaling ports has been hammered down fully 50 per cent. My informants believe that when this large quantity

of tonnage in American waters returns to this side, it will engage in whatever may be offered in Europe at that time, in preference to repeating the operation of carrying coal at 9s.; since, while there may be no money in bringing British coals into the Mediterranean for about 5s., there is always an opportunity to go from Marseilles to the Black Sea or to Spanish ports, where grain or iron ore may be picked up for delivery in England, while there is substantially nothing in the way of cargo to be taken back to New York.

A steamer of 3,000 tons cargo capacity can today load at Cardiff with navigation coal of the type usually required in this city at 12s. ($2.92) a ton. Assuming the owner to have contracted for payment at the rate of 7 francs ($1.35) per ton for freight (and this is today the very outside price), he must calculate upon expenditures amounting in all to 5.30 francs ($1.02) per ton before he can begin to take into consideration depreciation and profit. The official charges would perhaps vary somewhat from the figures I am about to give; but experience shows that upon a vessel of 3,000 tons the items of expense per ton, amounting to 5.30 francs, actually average as below. Assuming that the local charges at Baltimore would be the same as at Cardiff, and making due allowance for the increased length of the voyage, I establish the comparative cost per ton of delivering 3,000 tons of coal at Marseilles from either Cardiff or Baltimore as follows:

Description	Cardiff		Baltimore	
	Francs.		Francs.	
Trimming at Cardiff and port charges	0.70	$0.135	0.70	$0.135
Port charges at Marseilles	.60	1.15	.60	.115
Discharging at Marseilles	1.25	.241	1.25	.241
Deduction on freight(a common practice in lieu of re-weighing)	.50	.096	.50	.096
Fuel for voyage (10 tons per day, costing 12s. at Cardiff or 8s. at Baltimore)*	.50	.096	.65	.125
Wages and ship general expenses, at £10 per day (about)	1.75	.337	2.65	.511
Total cost per ton	5.30	1.02	6.35	1.22

* Steamers from Cardiff require 20 days for the trip; from Baltimore 30 days.

Thus, the owner shipping from Cardiff may look for depreciation, repairs, and net profits from the difference between 5.30 francs and an extreme of, say, 7 francs per ton, while the owner shipping from Baltimore must look for his from the difference between 6.35 francs and 11.25 francs—the apparent discrepancy being very much to the advantage of the steamer from Baltimore. But it requires one-third more time to ship from Baltimore, and the prospect of return cargo, moderately certain in the first case, is equally remote in the second. It will be noted that in practice, as much time is required for loading and discharging cargo from Cardiff the voyage, properly speaking, demands, and it may be assumed that one of the first efforts of American navigation companies will be to reduce this extended period. Demurrage charges in this port are practically unknown, and discharge facilities are at present limited to 600 tons per day.

Standard navigation coal from Cardiff is selling 22 s. ($5.34 in Marseilles. It cost 12 s. d 2.92 or 13s. ($3.16) with the export tax included. American competing coals are being sold here at a discount of 1s 6d. (36 cents). Experience and prejudice, or whatever the controlling causes have been, have set this margin as a measure of comparative quality. American coal at the seaboard, then, must be sold low enough to cover the higher freight charges and a persistent prejudice because of quality. The items average now from 4s. to 5s. In other words, it must be sold, quality for quality, at f. o. b. prices dangerously near 8s., or perhaps 9s. ($1.94 or $2.19), and every cent under these figures represents the advantage which our dealers have in the Mediterranean market at present.

We have sold 184,797 tons of American coal in Marseilles during eleven months of 1901, against 941,171 tons of British coal. It gave entire satisfaction. I have before me a lettter from Worms & Company, the heaviest single importers in which they say:

"Our importations of American coal during the year will approximate 100,000 tons. The principal companies to which we have sold it regularly are the Peninsular and Oriental Steamship Company, the British India Steam Navigation Company, the Nip-

pon Yushen Kaisha Steamship Company, and the Messageries Maritime Steamship Company. They have all declared themselves very well satisfied with the quality of the fuel."

As the case stands, dependent as we are upon foreign ships, we are in the Mediterranean coal trade, and we can probably remain, but there is always an "if." If, as at the height of the war excitement, we must again pay 21s ($5.10) while Cardiff pays but 10s, or 12s ($2.43 to $2.91) it is obvious that we can not cut our f. o. b. prices to that extent. That we could pay that enormous freight at one time was only because the f. o. b. prices at Cardiff were well over twice what they are today. Thus, while reasonable business policies encourage faith in the permanency of our Mediterranean coal trade under existing conditions, the mere memory of freight rates once paid is a standing menace.

Our commerce in coal can be guaranteed only by the land transportation lines engaging in the ocean carrying trade. Even small a fleet of colliers controlled by the coal roads would provide a steadying influence of inestimable value. A gentleman largely interested in foreign transport enterprise tells me that every Atlantic carrying company is shortening sail with a view to this contingency. He said:

"The American railroads are so important in themselves and drain such vast producing areas, thus contributing the bulk of east-bound freight, that they can not afford to remain in any sense dependent upon foreign navigation companies to take these goods to market. Whether they buy us out and run our ships for their own account, or secure legislation which will lead to the construction of a purely American fleet, it amounts to the same thing in the end. The railway companies can stand hard times as well as the British shipowner, and when the good times come their stockholders will pocket the profits, instead of ours. The through bill of lading would simply leave us without anything to stand upon, so far as American trade is concerned.

Briquetting Mesaba Ore.

THE time has come when the produceers of pig iron are brought face to face with a serious problem. The question is, must the large capacity blast furnace capable of turning out between 600 and 700 tons of iron a day, be abandoned? Already experience has partially answered the question and the large manufacturers are awaiting still further experience along new lines already started before they reached final decision.

The cause of this problem is found in Mesaba ores. Already the supply of lump ore for use in the blast furnace is utterly inadequate and is rapidly growing smaller. More than this the Mesaba ores are much cheaper to land at the docks, they are rich in iron, easily smelted, and contain but little phosphorus and sulphur. They are lacking in only one respect and that is their physical condition. And the exceeding fineness of these ores has given rise to the serious problem that now confronts blast furnace managers and owners.

Within the last score of years there has been two doublings in blast furnace capacity. Eighteen or twenty years ago a furnace that could turn out 150 tons of iron a day was a marvel of mechanical and scientific success. Then came the furnace of 300 to 350 tons of iron a day and manufacturers believed that the practical limit had been reached. It is not altogether certain at the present time that they are not right.

With lump ore the present monster 600 ton furnaces would unquestionably be a success. It is much less expensive to operate one of these furnaces than to operate two 300 ton furnaces. The cost of construction is less, the cost of labor in operating the furnace is less, and less power is required.

But lump ore is not easy to find and it is absolutely essential, to successfully manufacture iron, to use the fine Mesaba ores. In the 600 ton furnaces using a high per centage of Mesaba ores it is estimated that the loss in fine ores is from 40 to 50 tons a day in flue dust. Taking the lower figure with Mesaba ore at $3.50 a ton this is a daily loss of over $125.

Another drawback to the use of large quantities of fine ores in the furnaces, causing perhaps a greater money loss in the end and what is infinitely worse, jeopardizing the lives of the employes and the structure of the furnace and surrounding buildings is the explosions which may occur at any time and, in some cases are an every day affair.

The weight and exceeding fineness of the Mesaba ores when used in large quantities in a furnace are sure to cause clogging. The ore becomes packed together so closely that there is no opportunity for the gases to work their way through the mass. In consequence, gas pockets are formed, which explode with such force at times as to result in a large loss of both life and property. Sometimes where the gas pockets are formed near the top of the furnace, the weight on top is smal enough to enable relief by the blowing out of the top of the furnace of a few tons of ore. At other times, where the trouble is more deep-seated and the oppressing weight much greater, the result is a partial demolition of the furnace, perhaps loss of life, and the endangering, if not the destruction of surrounding buildings.

There are two visible means of overcoming these conditions. One is to abandon the present large capacity furnace and use two smaller ones to accomplish the same results. Even in this case there would be a loss of about eight per cent of ore escaping as flue dust, and it is not altogether certain that the explosion element would be entirely eliminated. In addition there is the much larger expense.

White Briquetting Machine.

The other remedy is to put the fine ore into solid block form before it enters the furnace. And herein lies the one factor of progress to be determined. The Henry S. Mould Company, of Pittsburg, has marketed a machine that can put the fine Mesaba ore into solid block form. These briquettes have already been submitted to intense heat and it has been demonstrated that there is no tendency toward decrepitation before the ore begins to smelt and the iron to run off.

The only experiment still untried is as to whether the great weight in the furnace will cause a crumbling of the briquettes. While this has never been demonstrated up to the present time, there is little doubt that the briquettes will stand the test. Smelters all over the world are using the machinery to great advantage at the present time and, while the weight is not so great, the process is largely the same.

The cost of briquetting is very low and, if it can be brought to a thorough and successful demonstration, the large blast furnace will stay and there is every reason to believe that even larger ones than those in use now will be made possible. If

the trial proves a failure the 600 ton blast furnace will have to be relegated to the junk heap or run on half capacity, or else torn down and two small ones built to take its place.

Several of the largest iron manufacturers in the country have already decided to try the briquetting process and it will be but a short time before adequate tests will demonstrate the feasability or worthlessness of the attempt.

Some Recent Inventions.

A DECIDEDLY unique snap switch has been devised by Charles J. Kintner, of New York city whose idea was to provide a structure made of the fewest number of parts. In its simplest form a base of insulating material is provided, having on its upper face a shoulder. To this base is fastened by means of binding posts the two sets of switch terminals, one having an upstanding projection located above the shoulder of the base, the other being in the form of a bowed spring that extends across the base, the free terminal of said spring being arranged to engage either against the shoulder, or the shoulder of the fixed terminal. Two springs are of course employed, and to these springs is attached a handle. The free ends of the springs can be engaged behind the shoulders of the fixed terminals thus completing the circuit, and when desired to break the circuit, it is only necessary to throw the handles in the other direction, moving the free terminals of the springs against the shoulders of the base.

The same idea is applied to wall or "flush" switches. In this case, a single spring is pivoted between the push buttons, and has oppositely extending arms against which the buttons bear. The free end of the spring engages a suitable contact piece secured to an insulating block which forms the rear wall of the casing, the contact piece being connected with one of the conducting wires while the spring is connected with the other.

A NEW method for covering electric conductors with insulating materials has been patented in this country by George E. Heyl-Dia, of Manchester, England. The invention consists in covering cables, conductors, or wires with pure rubber and vulcanized rubber in one operation by coating the vulcanized rubber with pure rubber before applying it to the cable or the like. The method of coating the vulcanized rubber is substantially as follows:

The pure rubber and the vulcanized rubber are calendered separately into separate sheets, then the two sheets are passed between warm rollers and under pressure in order to make them adhere to one another, and to force out the air from between them. The combined sheet thus made may be stored in any convenient manner for future use, being preferably wound on to the roller with a sheet of cloth between the turns or wraps to prevent the whole from sticking together.

In the coating operation, the composite rubber sheet or strip as above produced is applied to the wire or other conductor by means of groove pressure rollers in the usual way, the pure rubber side being turned next to the wire. The conductor thus covered may receive other layers of ordinary vulcanized rubber, or it may be braided or otherwise covered in any well known manner.

CONSIDERABLE difficulty is sometimes experienced in ejecting pigs from the molds in which they are cast, especially that class of molds used in machines employing endless sprocket chains to which the molds are attached. Edwin E. Slick, of Braddock, has patented a mechanism located wholly within the endless series of pig molds, entirely out of the way. He provides a knocker which is hung at its upper end, the lower end being formed into a heavy head that engages the molds at their proper dumping position. From this head extends a plunger rod, slidably mounted upon the frame of the machine and urged forward by a coiled spring surrounding it. As a result, the head will always remain in contact with the molds. The action of the knocker is entirely automatic, and operates on the molds in succession, as a pawl will operate on the teeth of a ratchet passing in contact

with it. As the molds pass, this head will strike one, giving a sufficiently heavy jar or blow to expel the pig, and as the mold proceeds in its regular course, will carry the knocker back against the tension of the spring until it has passed to a sufficient distance to release the knocker, which will return by gravity and the force of the spring, and impart a blow to the next succeeding mold.

A NEW coupling for rolling mill shafts has been patented by Messrs Jerome R. George, and Victor E. Edwards, of Worcester, Mass., who have sold their interests to the Morgan Construction Company, also of Worcester. The construction is described substantially as follows.:

Keyed upon the end of one shaft is a sleeve having its end overhanging the end of the shaft and provided with an interior fluted surface consisting of six equidistant ribs forming an equal number of grooves. An opening is made transversely through the sleeve, and the pin is passed through the opening, held in place by suitable cotter pins. To the end of the other shaft or gudgeon is keyed another sleeve, and to this is detachably bolted a collar constructed similarly to the first mentioned sleeve. The sleeve and collar of the two gudgeons are connected by a coupling bar preferably hollow and having at each end, longitudinally disposed ribs or teeth that enter the sleeve and collar and fit in the grooves. As a result, the two gudgoens or shafts are connected so that upon the rotation of one, motion will be transmitted through the bar to the other. The bar is held in place by the pin described, which passes through an opening in the bar.

ALFRED E. HAMMER, of Brandford, Conn., has for several years been making improvements in machines for making cores for cast pipe fittings of various shapes. The main idea is a reciprocating rammer, which compresses the sand in a suitably shaped core box. An improvement he has just patented is a new arrangement whereby bent portions of the core, such as curves or angles will be closely compacted. He employs a rammer having a deflectable head that will follow the curves or angles of the opening in the core box, and pack the sand or core material tightly in it. This deflectable head may be constructed in various ways; for instance, in one form he employs a roller hinged to the rammer stem by means of pivotal links; in another form he uses a head secured to the stem by coil springs. Another mode is a solid cylindrical rubber head.

TURNER H. NANCE, of Talladega, Ala., has patentd a ladle to handle molten metals in outdoor work. The bowl is of the usual shape, provided with a handle shank to one end of which is attached a grip; another grip is slidably and rotatably mounted upon the shank. The bowl is provided with a projection having a socket that detachably receives the end of a standard which may be driven into the ground.

In using the device, the standard is placed in the ground to one side of the fire. The ladle is supported upon the standard with the bowl over the fire and the slidable grip at the outer end of the handle. After the metal is melted it is only necessary to slide the grip to the lower end, whereupon a cool handle will be provided which does away with the necessity of the usual cloth.

A TUMBLING box on novel lines has been patented by William F. Patton, of Toledo, O. The object is to provide a device in which the rubbing action is facilitated by giving the castings and confined rubbing material a rotary tumbling as well as a sliding motion, causing the castings to simultaneously move in two different paths.

A pair of spaced sprocket wheels are mounted on separate frames, arranged to be driven by any suitable means. These sprocket wheels are connected by two inclined independent tumbling boxes, crossed to substantially an x-shaped structure. The castings to be cleaned are placed within the boxes, and as the boxes are rotated, the castings will not only be given a rotary motion, but will slide from end to end of the boxes.

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The Pig Iron Statistics.

The figures detailing the operations at the blast furnaces have a stronger than ordinary interest at present in view of the strained conditions in the iron and steel industries. The statistics just issued for the work of January have a hopeful aspect considered as a feature of the relative shortage in ready material. The aggregate number of furnaces in blast February 1 was 270, against a total of 259 January 1, a gain of 11 stacks. The aggregate weekly tonnage February 1 approximated in the weekly producing capacity, was 332,065 tons, against a weekly capacity of 311,830 tons January 1, an increase in weekly capacity of 21,078 tons. This is a favorable showing in the face of unreasonable shrieks of a famine. The gain has been complete according to the statistics.

The charcoal furnaces effected an increase in their weekly production of almost 50 per cent.

In the state outside of Pittsburg there was no gain in the number of active stacks, but we increased the number from 11 last month to 13 this month; Ohio moved up from a total of 14 furnaces in operation January 1 to 20 February 1.

Pittsburg's weekly tonnage increased from a total of 74,119 tons January 1, to 80,818 February 1, a gain of 6,699 tons.

Alabama is the only large producing section to show a loss, the whole number of stacks in that district dropping from 26 to 25, netting a weekly loss in production of about 1,000 tons.

No Danger of Famine.

The conservatism of the most influential element of the iron and steel markets which has been displayed with prominence for several months, was never more commendable than today. Without that force, operating in detail through the various departments of production, conditions, present and in the immediate prospect, would not bear the assuring features evident to the studious observer.

In discussing, in a recent issue, this phase of the metal trade situation as it exists, it was said that the reactionary movement incidental, in fact inseparable, from "boom" periods, need not follow the existing period of active production and equally active consumption if proper caution were observed. The wisdom of the conservative power in the iron and steel trades in refusing to become a party to any maneuver which has for its central object the rapid advance of costs and prices, was never more apparent than today. While those who are interested only in maintaining a market which does not require a safety valve are a unit in holding the conditions to a balance, the inflaters may rush about doing all in their power, which is happily not much, to "boom" the markets to the bursting point.

New York has been productive of interviews with men whose names are unattached to the printed declarations that as the year advances there will be a famine in iron and steel. The "famine" is so sure to come that everybody is becoming frightened at this early date! The fool killer rarely has a commission to lay about him among men in the iron and steel trades but here seems to have been a lost opportunity for a display of his prowess. Fortunately the number of men connected with the business in any capacity who are not well informed is so small that such an ill-advised story carries no influence anywhere. But it is a reason why the conservative element of the trades, as exemplified by the Carnegie Steel Company, the leading unit of the United States Steel Corporation, should continue its activity in preventing inflation.

If the retailers of the New York story had in mind the function of the word "famine" the silly trash would never have been given circulation in newspapers that should be ashamed to admit they published the stuff. Primarily, and in fact, a famine means a time of exhaustion following a failure of production in any given product. A failure of the ore mines to produce ore, or a failure of the blast furnaces to produce pig iron, would produce a famine in iron and steel, but the mere fact, which has occured times without number, that demand temporarily greatly exceeds supply in iron and steel, does not mean a famine in any sense.

And when it is remembered that the present call for finished material and even pig iron has become intense almost solely because of the shortage in last year's movement of material, the case does not bear a serious appearance. Let

it not be forgotten that December deliveries in every line except ore are still being shipped and the congestion of today has a ready explanation, one which will clear up the exaggerated shrieks about the dangers of the "famine." Let the railroads do their full duty and the mills will move along with such a rush that the old tonnage which hangs over from last year will soon be cleared up allowing a free attack upon the tonnage of 1902 which will be found to be not quite so enormous as to endanger the lives of manufacturers or consumers.

The mills are well supplied with contract tonnage at fair to good prices, nothing more. The small consumers are temporarily shut out because of the failure of the railroads to act promptly, but that may be overcome. But even if it is out there is no danger from a "famine" while the ore mines and blast furnaces are running even fairly well. The greater activity of the railroads will clear up the view almost magically.

The intention of the shriekers about "famine," plainly evident as a desire to force values to the speculative point, will defeat their purpose immediately. The same congestion exists in other departments of industry and there would be as much reason to howl about a famine in dry goods, or anything else one might choose, as in iron and steel. In this instance the result will probably show that the iron and steel trades are not more vulnerable than the other industries. Naturally while the blast furnaces and finishing steel plants are not operating to the extreme limit of capacity the difference between demand and supply will be maintained. But a better railroad service, which seems to be at hand, will give a relief that will materially mitigate the severity of the congestion, although under such a heavy demand there will remain some difficulty about shipments but that is an evil not peculiar to the present active period.

Forced to Act.

The meeting of the sheet manufacturers outside of the American Sheet Steel Company held in this city last week did not reach the proportions that the more sanguine of the promoters had anticipated, but those who pretend to have accurate information of the resources of those so vitally interested in the establishment of a reliable source of raw material supply exclusive of the limitations of the United States Steel Corporation, assert that another meeting to be held within a few days will be more to the point.

Whether this expectation is realized or not there can be no question of the desirability of such a state of affairs. At no time in years, if ever, have the conditions in the iron and stee trades, as regards the relations between producers and consumers, been so irritating as today. For the greater part of a year the general markets have been in an untidy state due directly to the uncertainties attending the movements of the principal producer of raw steel, and finished material as well. The greatest burden, however, was in the unsatisfactory distribution of raw steel. Later the question was as much affected by the responsibility of the railroads in their failure to make transfers of material to needed points, but the responsibility of the chief producer of raw steel cannot be evaded because of the tardiness of the railroads in preparing their motive department to meet the expansions fixed in other ways to handle a growing traffic.

The situation leaves no other course open to the individual consumers of raw steel than to attempt to establish another source of supply independent of the United States Steel Corporation. If they accomplish that they will have conferred a benefit upon the entire iron and steel trades, for just the proportion of steel which the independents are able to turn out will be released into the general markets by the United States Steel Corporation companies when the immediate crush incidental to a crowding together of the business of two years into one has been broken, as it undoubtedly will be. There are difficulties ahead of the independents in their proposed movement to supply their own raw steel but the difficulties may not reach the impossible.

Power of the Press.

The citizens of this community will have an unexcelled opportunity to judge of the power of the press in the coming municipal election. On one side are all the principal daily newspapers of both parties, with nearly all the prominent manufacturers, bankers, merchants and professional men of the city. The other side has two political sheets, the politicians, contractors, office holders, and other beneficaries of the municipality. Which will it be, the prominent journals or the political organs?

In our last issue an electric blue print machine was illustrated and described. A number of inquiries have been received at this office from parties asking for the name of the manufacturers. For the benefit of those who are interested we can state that the machine is manufactured by the Elliott Electric Blue Print Company, Liberty avenue, Pittsburg.

IN AND ABOUT PITTSBURG.

S. L. Kennedy and George C. McPeake, of Canonsburg have bought the James Peacock farm, near Canonsburg, and the S. W. McNary farm, on Chartiers creek, for Pittsburg investors who are discussing the feasibility of building a steel mill on the property. The sites are on the Chartiers Valley railroad.

The American Bridge Company, which has the contract to erect the various buildings of the new plant of the National Glass Company, at Rochester, Pa., has begun work on the construction of the main building. The material for the main building was to have been on the ground by September 1, last, but the delivery of the iron was not completed until within the past few days. Now that the stuff is all on the ground no more delay is anticipated. The American Bridge Company has been given the contract to furnish the steel superstructure for the Lincoln avenue bridge for $70,000. The only other bidder on the steel work was the Penn Bridge Company, at $79,585. Bids for the construction of the South Tenth street bridge are advertised.

Control of the property of the Gibson Oil Company on the Schuylkill river in the extreme Southwestern part of Philadelphia has been obtained by a Pittsburg syndicate representing the J. M. Guffey Petroleum Company, and the first storage plant for Texas oil on the Atlantic coast will be started upon it. The property comprises about 15 acres. The oil will be taken there from Sabine Pass by a fleet of steamships and barges owned by the Guffey company. Pittsburg workmen are in Philadelphia beginning the erection of one 40,000 barrel tank. This will be added to from time to time. Two steamships are also being converted into tank boats at Gibson's Point and the fleet of the Guffey company is being added to by purchases and conversions.

The Pennsylvania Rubber Company, of Erie, Pa., has decided upon a site at Jeannette for its new plant. A site of 20 acres and a bonus of $20,000 were given by the citizens of Jeannette as an inducement. The company will abandon its Erie works upon the completion of the new plant and will increase its output by 400 per cent. Plans in preparation provide for a main building 300x700 feet and a number of smaller buildings. The product of the company is mechanical rubber goods. F. A. Wilcox is general manager of the Erie plant, and E. Z. Jefferson is the Pittsburg representative with offices in the Empire building.

David Lamond & Son, of this city, are working on a new hot-blast stove for the Marting Iron & Steel Company, Ironton, O., and expect, by working double turn, to have it completed before March 1, the time called for in the contract. The stove is one of the Foote patents, 20 x 82 feet in size. It will be used as a reserve stove and avoid the necessity of a shut down of the furnace in case of injury to one of the three now in use or when there is necessity for repairs.

The Carnegie Steel Company has been awarded the contract to furnish 7,500 tons of structural steel for the new building of the Farmers' Deposit National bank, Fifth avenue and Wood street. Booth & Flinn, limited, will furnish the brick, of which about 2,500,000 will be needed. The Pope Cement & Brick Company, and Duncan & Porter will furnish the cement. Huston Brothers have been given the contract to furnish the lime.

The Keystone Bronze Company, Thirty-eighth street and Allegheny Valley Railway, this city, has bought ground 50 by 120 feet, extending from the rear of its plant to Thirty-ninth street, upon which it will erect a foundry building. The company is cramped for room in its present quarters. Upon the completion of the foundry the present building will be used entirely as a machine shop. The product of the plant is bronze for rolling mills and blast furnaces.

The Oliver Iron & Steel Company intends to add largely to its department for making taps and dies. The present quarters are small and it is the intention of the company to remove this department to a new building. Additional machinery will be required including six new milling machines and probably a turret lathe.

A number of improvements are being made at the plant of the Epping-Carpenter Company, this city, which include the installation of new machinery. The company reports an active demand for pumping machinery and condensers.

Henry C. Fry, Sr., Joseph A. West, H. W. Klein, William H. Beach and J. F. Peffer, of Beaver and Beaver Falls, have applied for a charter to build a bridge across the Ohio river from Beaver to Monaca.

An application for a charter will be made February 28 by the Kinnery Manufacturing Company composed of William C. Farr, Harry G. Spangler, and Charles P. Orr, to manufacture articles of iron and steel.

An application for a charter will be made February 24 by the Monongahela Brick Company. The incorporators are Joseph McK. Speer, J. Ramsey Speer, and James R. Taylor, all of Pittsburg.

At a recent meeting of the stockholders of the Kidd Brothers & Burger Steel Company it was decided to change the name of the company to the Vulcan Crucible Steel Company. The organization remains unchanged. The company has completed part of its plant at Aliquippa. and expects to have the entire plant with 90 pots in full operation by April 1. One of the melting floors was put in operation February 8 and a successful test with 30 pots was made. The officers of the company are W. S. Kidd, president; J. B. Graham, treasurer; S. G. Stafford, secretary; and S. Sutherland, manager of works.

The Irwin Foundry & Manufacturing Company, Irwin, Pa., will have the addition being built to its plant for the manufacture of mine cars ready for operation by March 15. The company recently completed improvements to its foundry and machine shop and reports the plant fully engaged on mine supplies, brass castings, grey iron castings and mine car wheels. The officers of the company are Chester D. Sensenich and Louis Malone.

The contract for 300 coke ovens for the Hecla Coke Company, at Hecla station, was awarded by William Glyde Wilkins to H. F. Stark, of Greensburg. The plant will be completed by August 1. Mr. Wilkins is completing plans and will soon invite bids for the opening of mines and the construction of coke ovens for the United States Coal and Coke Company's West Virginia field. The plans provide for 1,200 coke ovens.

A. S. Standish, 3036 Penn avenue, this city, has begun the manufacture of the Standish belt power hammer and other chain manufacturing machinery including geared link presses, etc.

The Prentiss Tool & Supply Company, of Pennsylvania, will apply for a charter February 20. The incorporators are Joseph E. Bissell, H. Prentiss and John J. Sorber.

The Pittsburg Reduction Company has bought, through the local representative of the Crocker-Wheeler Company, a 200 kilowatt engine type generator for its New Kensington plant.

NOTES OF THE INDUSTRIES.

The Lloyd-Booth department of the United Engineering & Foundry Company, Youngstown, O., has completed one and booked orders for two large shears. The completed shears are for the Cambria Steel Company, of Johnstown. The order for the pair is for the Labelle Iron Works, of Steubenville. The former shears weigh 95 tons and are supplied with a pair of intensifiers of 65 tons' weight. The steam cylinder on the intensifier is five feet five inches in diameter, that of the motor cylinder being 10 inches. The stroke is eight feet. With a hydraulic pressure of 2,000 pounds, fitted with a 42 inch plunger, the total pressure reaches 1,350 tons. In proportion are the tie rods which require four 12 inch square steel rods. The knives are four feet six inches. These 42 inch slab shears are for a 34 inch mill for the Cambria works and were designed by Julian Kennedy, Pittsburg.

J. D. Daniels, a former director in the American Linseed Oil Company, has bought ground at Cleveland, O., where a large plant will be built. The ground has been cleared and the contracts for the entire factory to be built of brick, steel, and stone, let to Sollit & Company, of Chicago. The factory will consist of four main buildings, the largest 150 feet long and 40 wide, together with a number of smaller buildings and two tanks for holding flaxseed, 40 feet in diameter and 50 feet high. New docks are to be built upon the property purchased. The latest and most approved machinery will be placed in the factory.

George E. House, chairman of the industry committee of the Wheeling, W. Va., Board of Trade, proposes the erection of a power building to be 100 x 120 feet, eight stories high. The committee reports that good headway is being made with the Wheeling Bridge Company. Stock subscriptions are very liberal, and there is every indication that in a short time the company would be formed and a valuable industry added to Wheeling. This is the company of which Mr. Barrett, of Pittsburg, will be manager.

Henry S. Hale, Philadelphia, representing a large corporation in which he is interested, has bought a tract of land at Eighteenth street and Lehigh avenue on which will be built one of the finest manufacturing plants in that city. It is the intention of the purchasers to erect a series of manufacturing buildings, which will be thoroughly up to date in construction and appointments. The cost of the entire operation will be about $250,000.

Application has been made by Senator William Flinn and Archibald McCrea, of Pittsburg, F. F. Marquard, W. H. Lewis and John B. Howatt, of Sharon, for the charter for an extended corporation to be called the Sharon Chemical Com-

pany. The capital stock is $200,000. The company will build a large chemical plant at South Sharon for the manufacture of chemical products.

The annual meeting of the Pacific Steel Company was held at Jersey City, February 4. These directors were elected: H. H. Swaney and M. J. Carrigan, of Port Townsend, Wash.; Maurice McMicken and William Piggott, of Seattle, Wash.; Captain John Irving, of Victoria, B. C.; Timothy O'Connor, of Merrill, Wis.; J. M. Hawthorne, of St. Paul; O. F. Thomas, of New York city; Frederick P. Day, of Jersey City; J. C. Smith, E. P. Douglass and L. Devenney, of McKeesport, Pa. The directors elected these officers: H. H. Swaney, president; Maurice McMicken, vice president; O. F. Thomas, secretary, and M. J. Carrigan, treasurer.

Colonel J. L. Beury, the New River coal operator, who, it was reported, was about to sell his mines and 35,000 acres of coal land to a syndicate seeking to control the entire New River field, has bought the extensive Quinnimont Coal & Coke plant from D. C. Boyce and becomes sole owner of the entire Laurel Creek property. The sale disposes of all efforts to monopolize the New River coal production.

Forty acres of land adjoining that owned by the Youngstown Iron, Sheet & Tube Company, Youngstown, O., has been bought by the company. The object in acquiring the land is to hold it for further additions which it may make to the works and not with the view to making any immediate extensions. The first sheets at the company's plant were rolled a few days ago, the mills running like clock work.

The American Cement Tile Manufacturing Company, which is to build a factory at Wampum, Pa., for the manufacture of roofing tile, will apply for a corporate charter at an early date. The incorporators are Ignatz H. Freund and Joseph Freund, of Pittsburg, Matthew Gunton, M. S. Marquis and Joseph S. Kaufman, of New Castle.

The stockholders of the Girard Boiler & Manufacturing Company, Girard, O., held a meeting a few days since and elected the following directors for the ensuing year: W. S. Kernohan, A. W. Kennedy, Parkes Williams, A. B. Camp, James A. Kennedy, Frank H. Klipp, A. J. Miller and others.

The Sharon Foundry Company has been organized at Sharon, Pa., with capital stock of $250,000. The leading parties in the new concern are James P. Whitla, of the Sharon Steel Company; Joseph Biddle and W. W. Shilling, of the Sharon Boiler Company. The company will build a big foundry at South Sharon.

Personal.

A. M. Swan, sales manager of the Henry Mould Company, manufacturers of briquetti machinery, has returned from a business t lasting seven months, during which he visi every smelter on the North American contine Many large smelters are using briquetting pre made in Pittsburg and he says that he secu many orders from other smelting interests, had not in the past made use of such machine

John Brunner, superintendent of the bur of engineering and construction of the Depa ment of Public Works, has resigned his place the employ of the city, and a few days ago ent ed the service of the Illinois Steel Company. Brunner has been connected with the bureau engineering and construction since 1896.

Edgar M. Moore, for three years purchas agent of the Philadelphia Company, has orga ed the firm of Edgar M. Moore & Company act as buyers in the Pittsburg district for o side consumers. Mr. Moore's acquainta with Pittsburg manufacturers gives his servi a peculiar value.

E. V. Jordan, who has been superintendent the plumbing and steam fitting department the Sharon Steel Company, Sharon, Pa., has signed and will go to Youngstown, where he go into the high pressure and hydraulic pres fitting business. His resignation will t place February 15.

Marshall Williams, formerly inspector of s practice at the Pencoyd Iron Works, has b appointed one of the district managers of American Bridge Company to succeed A. Schultz. He will have jurisdiction over the co pany's plants in Western Pennsylvania, Oh and Kentucky.

Benjamin H. Taylor has been appointed ch engineer of the Carnegie Steel Company, to t the place of W. H. Smith, who resigned Feb ary 1, to go with H. C. Frick. Mr. Taylor been associated with Mr. Smith for some t and is thoroughly conversant with the s company's methods and plans.

O. W. Russell has severed his connection editor of Power and Transmission and advertis manager of the Dodge Manufacturing Compa Mishawaka, Ind., to take charge of the adv tising of the Pittsburg Gage & Supply Compa

Reuben Miller, treasurer of the Crucible S Company of America, has gone on a tri Mexico. He will not return until spring.

Harry A. Keller has been appointed supe tendent of the Schothal Iron & Steel Compa of Cumberland, Md.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—The material features of the markets aside from those that have been current for the past month were the slow fuel supply from the coke region to merchant furnaces and the increased output of pig iron. The stormy weather had the usual effect upon the operation of the railroads running out of the coke region but this time in addition to a mere shortening of the coke supply the shortage was a cutting down of a supply that was not heavy at the best. The railroad operations have failed to reach the barest necessities of the iron and steel trades and any additional failures accentuate the situation proportionately. The trouble today lies solely with the weakness of the motive power department of railroad operations. The run of cars is strong; there are as many cars, or more, as are needed but there are not locomotives to haul them. The scarcity is felt more, naturally, in the coke and blast furnace ends of the markets as those departments have less leeway than the others.

The blast furnaces report an entirely inadequate supply of coke added to a short supply of cars at the furnaces for the transportation of iron. Some of the valley stacks are on three lines of railroad and have difficulty in getting a ready supply of cars from the combined roads. The finishing mills make the same report which commands a lessening in the speed of production. With a transportation equal to that of the movement of two weeks ago the blast furnaces and finishing mills would make inroads upon the delayed tonnage that is so influential in hampering the current business of all kinds.

Prices have not changed, and, so far as a future event may be anticipated, it seems safe to say that prices will not change materially throughout the year. The United States Steel Corporation stands in a sense pledged to prevent inflation and undeniably has checked all the flighty tendencies up to date. The fact that the tonnage contracted for and offered for iron and steel outruns the aggregate of any former year has been booked and material shipped at prices much below the "boom" prices of 1899 indicates the attitude of the corporation. New buyers find themselves out of the market, for, in the case of raw materials, pig iron and billets, they have been taken out of the running. The material which the big concerns is not-consuming is going to regular customers at the rates quoted, and which, by the way do not indicate the enormous pressure exerted upon the producers.

During the week 7,000 tons of Bessemer were sold for $16.25, at valley furnace, and probably half that much mill iron at $16.50, Pittsburg. Bessemer billets are still quoted at a minimum of $28.50, Pittsburg base, but that is for the smallest lots to regular buyers while higher rates are being paid where material is to be had. New business is refused at any price. The raw material market today rests not upon business offered at any price but upon the problem of how to make deliveries of tonnage contracted for.

CURRENT QUOTATIONS:

Basic	$16 75		Splice bars	1 50	
Bessemer		17 00	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	1C 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 69	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Grey Forge, Shn.	15 60		No. 1 wrought	15 50	
Bessemer billets	28 50	29 00	No. 1 cast	18 00	18 25
Open hearth	29 00	30 00	Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined.		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Bolts, iron, sq nut.	2 50		Sheets, 26	3 00	
Hex nuts	2 65		Sheets, 27	3 10	
Standard sections.	28 00		Sheets, 28	3 20	
Spikes	2 00				

PHILADELPHIA—While the market for iron and steel during the past week has shown the same general features of brisk demand and upward tendency of prices, the past few days has witnessed a somewhat lessened enthusiasm. Buying is not quite so active, owing to the fact that there are fewer consumers in the market whose wants have not been satisfied, at least temporarily. Prices have not, however, shown any sagging, nor is there any indication that there will be any reaction in values. Sellers continue firm in their views, and they have reason to be perfectly satisfied with existing conditions, especially as none of the active plants have failed to profit by the heavy demand of the past few months. So confident are the pig iron producers of the future that, while some weeks since they were willing to make concessions for delivery during the second half of the year, they are now demanding and getting full prices. The steel market is in a deplorable condition so far as supply is concerned, and some of the mills rolling axles, bars and sheets and other material are in distress for want of steel, and it is not likely that the situation will be any better until much of the now open-hearth capacity that is coming on the market is available.

As compared with a week ago, the local market for pig iron has gained still futher in firmness, and the continued difficulty of commanding prompt deliveries has stiffened prices to some ex-

tent. The consumption continues in excess of production, and stocks are almost totally exhausted. All grades of iron are equally scarce, and it naturally follows that prices are irregular, but in a general way would be quoted about as follows for the standard Northern brands at Philadelphia or nearby points: No. 1 foundry, $18 to $18.50; No. 2 foundry, $16.75 to $17.50; gray forge, $16 to $16.25.

Steel billets continue scarce and buyers are willing to pay $30 for reasonably prompt delivery, but the offerings are very light.

Business in finished iron and steel continues very satisfactory in all departments. Mills are well supplied with work and prices are firm, with an advancing tendency in some lines. Several large orders were booked by the plate makers during the week, and work in this department is now very abundant. The demand for structural material is enormous, and an advance in prices is hardly avoidable. Some of the smaller producers in the East are now securing $4 a ton above the prices which on heavy contracts are held as the minimum by the Beam Association. Nearly all the bar mills are running pretty well up to their full capacity. An active demand for both black and galvanized sheets is reported, and prices among the mills are firm, although it is stated that some of the jobbers who have bought stock when prices were lower are quoting lower figures than the mills.

CURRENT QUOTATIONS:

Fouudry, 1	$18 0	18 50	Girder rails	32 00	32 50
Foundry, 2	16 75	17 50	Angles, 3" & lr'gr		1 80
Gray Forge	16 00	16 75	Under 3-inch		1 90
Bessemer billets	29 00	30 00	T's 3" and larger		1 85
Open h'rth bil'ts	31 00	32 00	Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

NEW YORK—Rogers, Brown & Company's special report on the markets says:

Consumers of pig iron have this week felt the pinch of scarcity of material. Up to the opening of February, mills and foundries were able by one shift or other, to keep supplied. Furnaces accommodated urgent demands by delaying shipments on orders less urgent.

The limit of this, however, has been reached, and large consumers are up against a situation that has been defining itself for six weeks past. There simply is not enough iron to go around. Some very urgent inquiries for February-March deliveries this week have been met everywhere with the same answer, no iron.

Until a week ago, many furnaces were disposed to make slight concessions for contracts July to December. Now top prices are asked, and in some cases sellers have withdrawn entirely until they can see where they are going to land. While in some cases melters have doubtless made over provision for their wants to be on the safe side, the evidence is abundant that nine-tenths of the demand is to cover business actually taken by consumers or in plain sight. In every sense the market seems solid.

Prices, of course, have appreciated under this pressure and will average fifty cents per ton higher than a week ago. Many interests, like the leading Alabama producers, adhere nominally to the schedule but have no iron to offer before July or August. The conservative spirit is generally prevalent.

Quite naturally there is a fresh movement in the direction of importation of German and English materials, particularly heavy forms of steel. The importing houses are keeping the cables hot with large inquiries. The improvement in German and English markets which is now quite pronounced, tends, however, to check the import movement.

The car situation is again bad, and if not soon improved, further curtailment of output of pig iron seems certain. Railroads everywhere report more business than they can handle.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$17 50	18 00	Angles	2 00	[illegible]
No. 2X fdy Jersey City	16 65	17 15	Tees	2 00	[illegible]
No. 2 plain Jer. C.	16 15	16 65	Zees	2 00	[illegible]
Sohn. 1 fdy N. Y.	16 75		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	16 00		Com. base, bars per 100 lbs	1 65	[illegible]
No. 3 fdy N. Y.	15 50		Refined base, bars	1 85	[illegible]
No. 1 soft	16 75		Bands, base	2 40	[illegible]
No. 2 soft	16 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	[illegible]
			T rails steel f o b c	16 50	[illegible]
Sheets, blue annealed, 10	2 70	2 80	No. 1 wro't scrap iron f o b cars	17 50	[illegible]
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 mach. scrap	13 50	[illegible]
Plates ¼ and heav	3 15		Old wrought pipe and tubes	13 00	[illegible]
Ship & tank plate, on dock	2 50	2 50	Old car wheels, f. o. b. cars	16 00	[illegible]
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10		Old ham. car axl's f. o. b. cars	22 00	[illegible]
Beams and chan'ls 15-in & under	2 00	2 50	Wrought turnings deliv. at mill	11 50	[illegible]

CINCINNATI—Prices in the local pig iron market are as strong as last week. The demand is well sustained, and buyers are undoubtedly all consumers. Suspicions that purchasers are of speculative character are soon dispelled, and it is easily known that it is for necessities that orders are given. Consumers generally have bought to July, some to September, and others for the entire year. The small buyer who purchases from month to month, may have to discontinue.

While there have been several large lots of iron sold in the past week, small buyers were in evidence. Lots of from 100 to 500 tons have been the great feature of recent sales. Larg

numbers of the smaller founders have been coming into the market, and the aggregate tonnage of these is heavy. There are many inquiries in the market, and the immediate future is very encouraging. There is great demand for anything that can be had between this and July, especially for finished forms of iron and steel. A heavy tonnage is being booked for structural material, and the outlook is that the mills will be pushed to their full capacity all of this year.

The tone of the sheet market is strong, but it is not likely that prices will be any higher. The plate mills are well supplied with orders. Steel billets are being offered at $30, prompt delivery. Not a great business at this figure.

For all kinds of scrap, there is a demand. There are buyers ready to take anything offered, provided prices are satisfactory.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$15 50	Steel hoops.	1 95	2 50
South fdy. 2	14 75	15 00	Sheet. 26	8 50	
South. fdy. 3	14 25	14 50	Sheets, 27	8 85	8 85
South. fdy. 4	13 75	14 00	Sheets, 28	8 45	8 95
Grey forge	13 75	14 00	Angles, 3 to 6 in	1 75	2 50
Mottled	13 75	14 00	Angles, 1¼ to 2¼	1 75	2 50
Sohn. 1, soft	15 25	15 50	Beams and Chanls 15 in and under	1 75	2 70
Sohn 2, soft	14 75	15 00	I b'ms 18, 20 24 in	1 80	1 50
L. superior, fdy. 1	17 25	17 50	Tees	1 75	1 85
L. Superior, 2	16 75	17 25	Z's	1 70	1 80
L. sup'r char'l c w	19 25	19 75	1 wrought scrap	12 00	13 05
Hang'g r'k ccl, 1	20 50	21 50	Steel mlting stock gross ton	11 50	
Sohn ccl c w	19 25	19 75	No. 1 cast	11 00	
Jaksn cy. silv'y 1	16 75	17 52	Old iron rails g t'n	15 00	
St'l bs base hlf ex	1 75	1 90	Old car wheels	14 50	
Iron bars	1 75	1 90	Cast borings	5 00	
Flange plates	1 82	1 92	Turnings	5 50	
Tank steel	1 72	1 82			
Ordinary fire-box	1 92	1 97			
T rails	36 00				

CHICAGO—The past week has been made eventful through the extensive buying of pig iron for deliveries during the third quarter of the year. Transactions have been both large and numerous, the tonnage placed exceeding 40,000 tons. There would be still heavier trading in iron for immediate shipment were the metal procurable. It is very scarce and the market is remarkably strong. While the quotation for No. 2 foundry remains nominally at $16, it is doubtful if any iron is selling at that price and transactions are not uncommon at $17.50, or $1.50 premium. Southern iron also is lacking and commands a premium.

Bars continue in much the same condition as pig iron. Prices are nominally unchanged but so delinquent are sellers in getting forward their product that the market is constantly bare and the needy user is obliged to court material by offering inducements for delivery. The consumption was never greater in this territory. Structural material is wanted in excess of receipts and the market for finished products is on the whole unusually brisk, though in products like pipe and sheet, seasonably inactive, there is not the demand that exists in some other products.

Old material is slowly appreciating. Country receipts are small because of the cold weather and snows, and there are more frequent calls from users. Scarcity of pig iron is giving an added impulse to cast scrap, prices rising steadily. All kinds of steel scrap also are in excellent demand.

CURRENT QUOTATIONS:

Bessemer	18 00	18 50	Sheets, 26 store	3 20	3 30
Fdry Nohn 1	16 50	18 00	No. 27	3 30	3 40
Northern 2	16 00	17 50	No. 28	3 40	3 50
Northern 3	15 50	17 00	Angles	1 75	
Southern 1	16 15	16 90	Beams	1 75	
Southern 2	15 65	16 40	Tees	1 80	
Southern 3	15 15	15 90	Zees	1 75	
Forge	14 50	15 40	Channels	1 75	
Charcoal	20 00	20 50	Steel melt'g scrap	14 00	15 00
Billets, Bessemer	30 65	32 00	No. 1 r. r. wrought	16 50	17 00
Bars, iron	1 75	1 80	No. 1 cast, net ton	12 50	13 00
Bars, steel	1 65	1 75	Iron rails	21 50	22 50
Rails, standard	28 00		Car wheels	16 50	17 50
Rails, light	31 00	34 00	Cast borings	6 00	6 50
Plates, boiler	1 90	2 00	Turnings	11 00	11 50
Tank	1 75	1 80			

BIRMINGHAM—The Southern iron market has stiffened to the point where it is impossible to secure spot iron without giving a premium. The Sloss-Sheffield Steel & Iron Company is understood to be sold to the extent of 120,000 tons for delivery up to July on a make of about 22,000 tons per month. It is out of the market for large orders for delivery prior to July 1. Last week basic iron brought $13.60 per ton, some of it going to the Carnegie works at Pittsburg and some to the Pencoyd Iron Works near Philadelphia. The total sales at this figure averaged 1,000 tons. Many small lots of grey forge obtained fifty cents premium, going at $11.50 per ton, while No. 2 foundry is flat at $12 as a minimum. The Tennessee Coal, Iron & Railroad Company is making for the first time in the history of the South, thirty feet one and a half and two inch billets at its new rail mill and finds ready sale for them. The steel plant of this company is behind on orders and it is difficult to place new ones. The soil pipe trade shows signs of picking up in the very near future. The plants in the Birmingham district are receiving substantial orders in prospect of the revival of house building. The Talladega iron furnace has gone into full operation after a long idleness and the Trussville furnace is enjoying a successful run. A number of new coal companies were organized during the week. The leading iron brokers regard the industrial situation as the strongest it has been since recovery from the panic of 1839-4.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 00	12 50	Tank	1 80	
No. 2 fdy, Sohn	11 75	12 00	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 00	11 25	No. 1 wrought	14 00	
Grey forge, Sohn	10 50	10 75	No. 1 cast	12 00	
Billets	27 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	310	3 60
Fire box	2 00				

Coal.

PITTSBURG—The adjustment of the mining rate by the re-adoption of last year's wage scale in its entirety relieves the strain that was a source of agitation to consumers. That agreement makes certain the one point at least that, whatever the season's rate for coal may be, the coal companies will not be able to add to any increase, which is probable, in the shape of extra wages to the miners. The miners say they are satisfied, and if that is the case the other persons interested in coal certainly should be. The run of cars at mines is not improving and is a source of annoyance to manufacturing concerns using coal exclusively for fuel.

CLEVELAND—The vessel owners have made a stand this early in the year for a better rate for coal and ~~if both~~ sides maintain their position it looks as if the shippers will have some difficulty in moving coal promptly. That seems to be the only live point in the coal situation and heavier shipments than usual to docks may assist the vesselmen in making a successful fight for a higher rate.

CINCINNATI—With each succeeding day of cold weather the coal market takes on additional strength and the fear is that a famine is liable should the weather not moderate soon. Shipments being received by rail, the only source of new supplies at present, are not adequate and a hole is being made in reserve stocks. Consumers in surrounding towns and cities are compelled to resort to the hand-to-mouth method picking up a little here and there. At Columbus, O., the situation is serious and a plan has been evolved to hold up freight trains bearing coal, irrespective of its destination.

CHICAGO—The Pittsburg Coal Company has begun making notable improvements at Chicago. Docks are being enlarged and both lake and all-rail coal will be handled here next season more vigorously than ever before. Eastern producers generally are preparing for a larger business in 1902. Receipts of Eastern coals during the past week were seriously restricted by the snow storms, the greatly needed fuel being sidetracked and renewing the congested condition of traffic from which the trunk lines had barely extricated themselves. Even the Western roads proved unequal to the demand for cars and the market early this week is again quite strong, some grades selling about 25 cents higher than at any time within a month. The cold weather was the sole cause of the scarcity. Coke also became scarce again last week because of the cold weather, especially standard makes, and prices were slightly advanced.

Coke.

The car supply in the Connellsville coke trade was very light last week and shipments show a heavy decline. Western shipments were over 1,200 cars less than the week previous, and a most serious condition is threatened. The snow and cold weather is impeding train movements and sufficient coke is not being moved to keep the furnaces in blast. Shipments were lighter last week than has been reported for several weeks and with the exception of one or two weeks in the early part of December, were the lightest in many months. The majority of the furnacemen have their product sold up to the last of the year and in many instances are back in present deliveries. They are willing to pay most any price for special shipments to keep the furnaces going and were it possible to make shipments the 150,000 to 200,000 tons of surplus coke on the yards could be marketed at very fancy prices. The car supply the first days of this week is very light and unless there is milder weather, production will be restricted the last days of the week. The yards are so crowded with surplus coke at many plants that it is difficult to handle the coke with a short car supply.

A summary of the Connellsville region for the week shows 21,288 ovens in blast and 827 idle.

The following figures show the scope of operations.

Production for the week	223,214 tons.
" last week	223,976 tons.
Decrease	762 tons.
Shipments—	
To Pittsburg and river points	3,707 cars.
To points West of Pittsburg	4,183 cars.
To points East of Everson	1,710 cars.
Total	9,600 cars.
Last week	10,854 cars.
Shipments in tons for week	213,600 tons.
" " " last week	241,501 tons.
Decrease	27,901 tons.
Masontown Field	
Shipments for week	482 cars.
" last week	650 cars.
Decrease	168 cars.
Shipments in tons	12,232 tons.
" last week	16,900 tons.
Decrease	4,668 tons.

Coke Prices.

Pittsburg—Furnace, \$2.25@2.50. Foundry, \$2.50@2.75.
St. Louis—Connellsville, \$5.25@5.50. West Virginia, \$4.25@4.50
Cincinnati—Connellsville, \$5.00@5.25. Kanawha, \$4.25@4.50
Oonega, \$4.25.

The Metal Markets.

LONDON—Tin—£112 12s 6d-£109 5s. Sales, 440 tons spot; 790 tons futures.

Copper—£55 2s 6d-£52 5s. Sales 1,700 tons spot; 3,750 tons futures.

Lead—£11 12s 6d-£11 2s 6d.

Spelter—£17 15s-£17 10s.

NEW YORK—Tin—$24.55-$24.25.

Copper—Lake, $13.50-$12.87½; electrolytic, $13.25-$12.50; casting, $12.87½-$12.50.

Lead—$4.10.

Spelter—$4.20-$4.05.

ST. LOUIS—Lead—$4.05-$4.00.

Spelter—$3.90

Wire and Nails.

Wire, plain, car lots, jobbers	$2 05
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 25
Cut nails, less than car lots, retailers	2 35

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10	c
Copper, light bottoms	8	c
Heavy Composition	9 to 10½	c
Brass Turnings	6½	
Heavy Brass	7 to 7½	c
Light Brass	6.00	
Heavy Lead	3.75	
Tea Lead	3.50	
Zinc Scrap		$3.00
No. 1 Pewter	16	

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 50
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4.00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4.75.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots......37c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ......35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots......34c. pr. lb.	1000 lb. to ton lots......33c. pr. lb
100 lb. " ......33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ......35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots......36c. pr. lb.	1000 lb. to ton lots...... 29c. pr. lb.
100 lb. " ......30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lots of 100 pounds, $1.10 per lb.; special price on large lots.

OBITUARY.

OSCAR M. BURKE.

Oscar M. Burke, one of the oldest and most prominent residents of Cleveland, died at his home, 813 Prospect street, that city, February 4, aged 79 years.

Mr. Burke was best known as one of the founders of the Lake Shore Foundry, now one of the branches of the United States Cast Iron Pipe & Foundry Company, of which his son, Colonel Clarence E. Burke, was one of the organizers.

JOHN S. WILLIAMS.

John S. Williams, president and manager of the Forest City Steel & Iron Company, died last Thursday at the home of his parents on Franklin avenue, Cleveland, aged 40 years. He was a member of the Civil Engineers' Club and the Cleveland Yacht Club, but for the past year had been an invalid and was forced to relinquish social duties.

Mining Scale Adopted.

The national convention of the United Mine Workers adopted a scale for the coming year, February 7. The new instrument is a re-affirmation of the scale of 1901 as a whole. It provides for the following prices for mining coal:

Pick mining, 80 cents per ton, thin vein, Pittsburg; 80 cents per ton, Hocking Valley; 80 cents per ton, Indiana bituminous; 90 cents a ton, Indiana block.

Run of mine, 40 cents a ton, Indiana bituminous; 40 cents a ton, Danville, Ill.; 57 1-17 cent Hocking Valley, when run of mine exists; 51¾ cents, Pittsburg district. No change was made in the mining scale from last year.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including February 10, 1901:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUN
Transit	194,596	93,884
Tidewater	86,596	22,871
Southwest	15,934	70,827
Eureka	11,600	252,140
Buckeye, Macksburg oil	553	81,906
New York Transit	170,391	
Southern	202,146	......
Crescent	20,310	......
Total	702,126	521,628
Daily averages	78,030	58,825

LIMA.

Buckeye / Indiana Local Division	493,913	317,696
Daily average	54,879	35,299

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
February 5	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
February 6	1.30	1.15	1.15	0.83	0.80	0.80
February 7	1.30	1.15	1.15	0.83	0.80	0.80
February 8	1.30	1.15	1.15	0.83	0.80	0.80
February 10	1.30	1.15	1.15	0.83	0.80	
February 11	1.30	1.15	1.15	0.83		

Coal Company's Statement.

The financial statement of the Pittsburg Coal Company read at the annual meeting at Jersey City yesterday failed to present the favorable features claimed by some but disclaimed by the majority of well informed men. The stockholders who had nerved themselves for a disappointment were not deceived but used some expressive language. The report follows:

ASSETS—Coal acreage, surface lands, mine plants and equipment, miners' houses and other buildings, $62,709,795.77, an increase over 1900 of $3,607,702.98. Railways owned and operated—Pittsburg & Moon Run, Montour and Youghiogheny & Wick Haven, $1,498,877.80, an increase of $18,083.66. Lake shipping docks, $2,937,829.11, an increase of $97,194.54. Coal on hand at Northwestern docks, at cost, $651,195.69, an increase of $173, 613.28. Railway cars, $1,899,171.-04, an increase of $576,178.91. Capital stock of other companies, $631,474.51, an increase of $407, 242.07 Accounts and bills receivable, $4,932,267,-27, increase of $1,015,254.55. Cash $1,015,977.50, increase of $226,232.93 Total, $76,276,768.69, an increase of $6,121,502.90.

LIABILITIES—Preferred stock, $29,701,200; common stock, $30,268,200, increase of $273,500; reserve fund—royalty on coal mined, $1,403,762.-17 depreciation of plant, cars, live stock, $1,003,-384.67; undivided earnings, $3,188,053.95; total liability to stockholders, $65,564, 600.79; bonds of underlying companies assumed, $1,079,000: mortgages assumed for underlying companies, $117,-678,72; liabilities created in recent coal acquisition, $6,192,395.59; current accounts and bills payable, $3,323,093.59.

EARNINGS—Profits from mining, deducting expenses, bad debts and losses, $4,272.209.26, decrease, compared with operation of first 16 months, $1,208,481.17; royalty, $576,846.78; de crease of $250,068.61; depreciation of plant, $514,139.38, increase of $189,528.95; depreciation of cars, $81,685.04, increase of $34,251.04; net earnings, $3,099,538.06, decrease of $1,142,552.08; preferred dividends, $2,078,865,25.; undivided earnings for 1901 appropriated for preferred stock dividends and working capital, $1,020,672.81, decrease of $1,146,708.19. These earnings are at the rate of $1,360,896.08 for 16 months, compared with $2,167,381 during the first 16 months of the company's existence. During that period it was stated the mines were not working at the highest standard.

The value of coal still on Northwestern docks at the end of December, was almost $200,000 greater than last year. The old board of directors was re-elected as follows: F. L. Robbins, J. D. Nicholson, H. W. Oliver, A. W. Mellon, H. C. Frick, D. R. Hanna, John A. Bell, M. H. Taylor, P. M. Hitchcock, G. B. Schley, A. M. Neeper, J. I. Bishop, U. A. Andrews, W. P. Murray and F. M. Osborne.

Pennsylvania's Progress.

The figures identified with Pennsylvania's operations in manufactures for the census decade ending with 1900 are given thus by the Census Bureau:

Number of establishments, 52,185, increase 33 per cent; capital, $1,551.548,712, increase 57 per cent; wage earners, average number, 733,834, increase 29 per cent; total wages, $332,072,670, increase 26 per cent; miscellaneous expenses, $134,-344,269, increase 80 per cent; cost of materials used, $1,042,561,628, increase 35 per cent; value of products, including custom work and repairing, $1,835,104.431, increase 38 per cent.

Pittsburg is slightly above the normal in all particulars, the establishments having increased from 1.429 to 1,937, or 36.4 per cent; the capital from $108,368,838, or 78.2 per cent; the wage earners from 52,963 to 69,953; the total wages per annum from $29,833,486 to $36,669,563, or 22.7 per cent; miscellaneous expenses from $7,561,199 to $15,292,662: cost of materials from $69,892,195 to $116,830,084, or 67.2 per cent; value product, including custom work and repairing from $126, 859,657 to $203,236,426, or 60.2 per cent.

Allegheny shows the number of establishments increased from 675 to 894, or 32.4 per cent; capital from $22,253,243 to $50,163,003, or 125.4 per cent; wage earners, average number from 11,-857, to 220.828, or 75.7 per cent; total wages from $5,916,525 to $10,367,502, or 75.02 per cent; miscellaneous expenses from $1,728,571 to $5,120,624, or 296.1 per cent.

Other returns are: Altoona—Capital, $7,298,-819; products, $12,877,528, increase 23 per cent. Erie—Capital, $20,418,010, increase 59 per cent; products, $19,053,202, increase 49 per cent. Harrisburg—Capital, $8,749,616, increase 30 per cent; products, $16.064,597 increase 52 per cent. Johnstown—Capital $16,940,450 increase 28 per cent; products $22,559,890 increase 23 per cent. McKeesport—Capital, $17,876,016, increase 63 per cent; products, $37,074,136, increase 113 per cent. Philadelphia—Capital, $476,591,792, increase 27 per cent; products, $603,587,392, increase 5 per cent.

New Castle was not separately reported in 1899, but now shows; Capital, $13,308,220; products, $21,179,072.

The Browning Engineering Company, Cleveland, will enlarge its plant this spring by the erection of a large foundry.

otes of the South.

:. E. Robinson a holder of 800 shares of stock the Alabama Steel & Wire Company's rod ll, at Ensley, has asked for the appointment of receiver to take charge of the properties. He clares that E. T. and G. H. Schuler and other ckholders who are in control and ousted him, ve grossly mismanaged the affairs of the comny, etc. The Schulers were last week adjudged ilty of contempt of court for destroying books d accounts contrary to order of court and senced to five days in jail.

The Southern Brick Manufacturers' Association was organized in Atlanta last week with e following officers: President, F. L. White, bany, Ga.; vice-president, F. A. Copeland, rmingham; secretary, and treasurer, H. L. glish, of Atlanta.

The Hood Machine & Foundry Company has ipped to Honduras, Central America, an hydrau- wheel press for use by a railroad. The shipmt is via New Orleans. The same firm has mpleted two steam dumping pots for the odward Iron Company.

C. E. Buek & Company, operators of the ussville furnace, have bought of W. H. Graves) acres of coal land near Birmingham for $40,-). The coal will be utilized at the furnace.

The Birmingham Pipe & Casting Company sumed operations this week after being closed wn for several weeks for the institution of provements, which include a steel stock shed.

N. F. Thompson and associates are endeavor- g to secure franchises for the erection of an ectric car line to unite the cities of Florence, effield and Tuscumbia, Ala.

It is reported that parties who have secured tents for the manufacture of Russian iron, e contemplating the erection of a plant at nsley.

rocker-Wheeler Machine Shipments.

The Crocker-Wheeler Company of Ampere, N. , has just issued a new bulletin, No. 18, desibing the electrical equipment of the Joseph Iron Crucible Company, of Jersey City. This mpany which formerly operated four separate am plants has combined them into one electric wer plant. A 100 k. w. generator and 24 mors all of Crocker-Wheeler manufacture, have en installed and future equipment is contemated.

The company reports that the outlook at the d of the first month of the new year is highly omising, both in present orders and in the indications for a heavy spring business. Among the January shipments may be noted the following:

De Lamar Copper Refining Company, Carteret, N. J., 520 k. w. generator; 100 k. w. generator; 50 k. w. generator; Iron City Engineering Company, Uniontown, 100 k. w. generators; Anglo-American Provision Company, Chicago, Ill., 7 motors ranging from 10 to 75 h. p.; Pennsylvania Steel Casting Company, Chester, Pa., 350 k. w. generator; Quintard Iron Works, New York city. 65 k. w. generator; Marine Engine & Machine Company, Harrison, N. J., two size 111, 50 k. w. generators; 60 h. p. motor; two 35 h. p. motors. United States Electric Lighting Company, Washington, D. C., 90 k. w. generator; 130 h. p. motor; National Tube Company, Pittsburg, 110 k. w. generator; Niles Tool Works, Hamilton, O., consignment of motors; Erie Rapid Transit Railway, Harbor Creek, Pa., 200 k. w. generator; Lake Shore & Michigan Southern Railway shops, Collinwood, O., 400 k. w. generator; 75 k. w. generator; Mechanical Laboratory Lehigh University, South Bethlehem, Pa., 30 k. w. generator; American Car & Foundry Company, Madison, Ill., 110 k. w. generator; Armour Fertilizer Works, Atlanta, Ga., 150 k. w. generator; 2-50 h. p. motors; 90 h. p. motor; Park Steel Company, Pittsburg, 200 k. w. generator; J. K. Farley Manufacturing Company, Chicago, Ill., 150 k. w. generator; Fort Hill Chemical Company, Rumford Falls, Me., our 140 k. w. generators.

Keystone Is Absorbing.

The preliminary work was begun at Philadelphia, February 9, for the formation of the Keystone Coal & Coke Company, with a capital of $2,500,000. The officers of the company will be: President, former Congressman George F. Huff; secretary, Richard Coulter, Jr.; and treasurer, L. B. Huff, all of Greensburg. The combine will include the following companies: Greensburg Coal Company, Hemphill Coal Company, Carbon Coal Company, Arona Gas Coal Company, Sewickley Gas Coal Company, Madison Gas Coal Company, Claridge Gas Coal Company, Salem Coal Company and the present Keystone Coal & Coke Company.

The stockholders of the Sewickley and the Carbon Coal Companies voted in favor of the consolidation that afternoon. The shareholders of the other companies will meet in Greensburg to ratify the action of the men who control a majority of the stock in the several corporations.

The coke crusher at the Standard works of the H. C. Frick Coke Company, at Mt. Pleasant, burned February 6, with a loss of $20,000.

One More Consolidation.

The Railway Steel Spring Company was given preliminary form last week by the consolidation of 95 per cent of the producing capacity in that line. The company was chartered in New Jersey with a capital of $20,000,000, divided equally into common stock and preferred the latter 7 per cent cumulative, entitled, in addition to dividends, to the payment of its par and all unpaid dividends upon the distribution of assets. The corporation cannot mortgage any of its property, except by purchase money mortgage, without the assent of two-thirds in value of the preferred stock. The company acquired $1,500,000 in cash for working capital in addition to the property patents, equipments and good will of the various combining companies. The company will have a yearly capacity of 60,000 tons of steel railway springs. No formal organization has been effected, and no plans outlined for the improvement of any of the plants. Meetings will be held in New York this month, and the formal organization may be effected before March 1. The companies to be included in the combination are the Detroit Steel & Spring Company, National Spring Company, Pickering Spring Company, limited, and the Charles Scott Spring Company, of Philadelphia, in addition to the two Pittsburg interests.

The combination was promoted by Frank B. Smith, secretary of the Crucible Steel Company of America, and two Pittsburg interests will form the most important part of the new company, the A. French Spring Company and the railway spring department of the Crucible Steel Company. The presidency of the combine has been offered to Mr. Smith, and in the event of his acceptance the headquarters will be in Pittsburg. Financial headquarters will be in New York, and Pittsburg will be the center of manufacturing. The interests of Mr. Smith are so closely connected with the crucible combine that it is not expected he will accept the offer to leave it. No other name has so far been mentioned.

Patents.

The following patents granted February 4, 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa., from whom printed copies may be procrued for 15 cents each:

Water tube boiler, J. A. Anderson, Brooklyn, N. Y.; flue connection for furnaces, S. C. Collin, Phildelphia, assignor to William White, Jr., Pittsburg; furnace grate and stoker, Frederick Girtanner, New York; engine crossheads, F. D. Holdsworth, Claremont, N. H., assignor to Sullivan Machinery Company, same place (2); valve gear, same, assignor to same; steam engine, J. G. A. Kitchen, Windermere, England; method of treating copper ores, W. J. Knox, Edgewood Park, Pa., assignor to George Westinghouse, Pittsburg; kiln for drying green sand ores, R. F. Phillips, Pittsburg; feed water heater and condenser, J. W. Stansfield, Hartlepool, England; apparatus for separating grease from steam, W. J. Baker, Scarborough, England; mill for rolling seamless tubes, W. H. Robbins, J. J. Bye and A. E. Jones, Ellwood City, Pa.; low-water alarm, C. H. Shuttleworth, Corunna, Mich.; car haul, A. M. Acklin, Pittsburg; press for forging axes, E. P. Alexander, Yeagertown, Pa.; steam separator, H. C. Baum, Reading, Pa.; crane, S. L. Batzel, Reading, Pa; sparking igniter for explosive engines, D. P. Clark, Grand Rapids, Mich; apparatus for separating minerals by the selective action of oils, A. S. Elmore, London, England; steam engine indicator, W. H. Harrison, Braintree, Mass.; valve mechanism for duplex engines, H. A. Jensenius, Camden, N. J., assignor to Camden Iron Works, same place; hot blast stove, C. W. A. Koelkebeck, Pittsburg; mechanism for feeding blast furnaces, A. B. Neumann, Joliet, Ill.; sparking igniter for explosive engines, G. M. Thompson, Phildelphia. oil sand flooder A. E. Barnhart, Millerstown, Pa.; smelting furnace, H. E. Auman, Reading. Pa., assignor to the Harvey Burner & Furnace Company, Reading; hoisting engine, Colin Campbell, Newark, N. J.; smoke consuming furnace, H. G. Cox, Indianapolis; cut-off gear for steam engines, W. D. Hooker, St. Louis; furnace grate, J. L. White, Superior, Wis., assignor to J. L. White Furnace Company, Milwaukee; condenser system, C. C. Worthington, Dunnfield, N. J., and L. R. Alberger, New York.

A Big Paint Order.

The American Car & Foundry Company ha placed an order for 120,000 pounds of "perfection freight car paint" with the M. B. Suydam Company, of this city, to be used on 1,000 Pittsburg & Lake Erie Railway cars, being built. The Suydam company recently completed improvements to its plant at Sixty-first street and the Allegheny Valley Railway and has a daily output of 25,000 gallons of paint and 25,000 gallons of oil. A specialty is made of railway and mill paint. The company was also awarded the contract to furnish the paint to be used on the plant to be built for the Standard Steel Car Company, of this city.

Condition of the Blast Furnaces in the United States, February 1, 1902.

Compiled for the American Manufacturer and Iron World.

LOCATION OF FURNACES.	CHARCOAL. Total No. Stacks.	In Blast. No.	In Blast. Weekly capac'y	Out of B'st. No.	Out of B'st. Weekly capac'y	ANTHRACITE AND COKE. Total No. Stacks.	In Blast. No.	In Blast. Weekly capac'y	Out of B'st. No.	Out of B'st. Weekly capac'y	BITUMINOUS AND COKE. Total No. Stacks.	In Blast. No.	In Blast. Weekly capac'y	Out of B'st. No.	Out of B'st. Weekly capac'y
Alabama	5	2	682	3	798						39	25	24,098	14	[illegible]
Colorado											3	2	2,600	1	[illegible]
Georgia	3	2	770	1	125						1	0	0	1	[illegible]
Illinois											19	16	31,344	3	[illegible]
Kentucky											8	4	1,911	4	[illegible]
Maryland }	5	0	0	5	372						5	3	5,500	2	[illegible]
Virginia }											21	15	9,427	6	[illegible]
Missouri	1	1	444	0	0						1	0	0	1	[illegible]
New England	7	3	279	4	360										
New Jersey						8	3	3,123	5	2,766					
Spiegel						3	3	522	0	0					
New York	3	2	722	1	75	7	2	1,298	5	2,798	10	4	5,771	6	[illegible]
North Carolina											2	0	0	2	[illegible]
Ohio—Eastern, Central and Northern											23	20	32,309	3	[illegible]
Hanging Rock District	6	2	97	4	336						12	10	6,220	2	[illegible]
Hocking Valley											8	2	790	1	[illegible]
Mahoning Valley											13	13	29,059	0	[illegible]
Oregon and Washington	2	1	100	1	280										
Pennsylvania general	8	2	86	6	506						6	5	5,878	1	[illegible]
Juniata and Conemaugh Valleys											15	9	12,952	6	[illegible]
Lebanon Valley						11	9	6,230	2	1,100					
Lehigh Valley						30	19	9,688	11	5,358					
Pittsburg district											33	31	80,818	2	[illegible]
Spiegel											1	1	2,491	0	[illegible]
Schuylkill Valley						16	11	8,976	5	3,110					
Shenango Valley											18	16	24,475	2	[illegible]
Susquehanna Valley, Upper						3	1	397	2	1,335					
Susquehanna Valley, Lower						11	7	6,410	4	1,350					
Tennessee	3	1	82	2	625						17	11	7,178	6	[illegible]
Texas	4	1	140	3	725										
West Virginia											3	2	2,633	1	[illegible]
Wisconsin and Michigan	10	6	3,702	4	1,405										
Wisconsin and Minnesota											6	3	2,947	3	[illegible]
Total	57	23	7,104	34	5,592	89	55	36,644	34	17,817	259	192	288,317	67	[illegible]

Blast Furnaces Feb. 1, 1902.

The following table gives the number and capacity of furnaces in and out of blast February 1, 1902:

Condition of Blast Furnaces in the United States February 1, 1902.

Fuel.	In Blast. No.	In Blast. Weekly Capacity.	Out of Blast. No.	Out of Blast. Weekly Capacity.
Charcoal	23	7,104	34	5,592
Anthracite and Coke	55	36,644	34	17,817
Bituminous and Coke	192	288,317	67	51,300
Total	270	332,065	135	74,709

Compared with January 1, the standing of the furnaces in blast was as follows:

Furnaces in Blast January 1, and February 1, 1902.

Fuel.	January 1. No.	January 1. Weekly Capacity.	February 1. No.	February 1. Weekly Capacity.
Charcoal	22	6,746	23	7,104
Anthracite and Coke	56	37,845	55	36,644
Bituminous and Coke	181	267,239	192	288,317
Total	259	311,830	270	332,065

The above comparison shows:

Increase in active charcoal furnaces, 1.

Increase in weekly capacity charcoal furnaces, 358 tons.

Decrease in active anthracite and coke furnaces, 1.

Decrease in weekly cap. anth. and coke furn's, 1,201 tons.

Increase in active coke and bituminous furnaces, 11.

Increase in weekly cap. bit. and coke furnaces 21,078 tons.

Net increase active furnaces, 11.

Net increase weekly capacity, 20,235 tons.

The following tables show the anthracite and coke and the bituminous and coke furnaces in blast in the various districts January 1 and February 1.

Anthracite and Coke Furnaces in Blast Jan. 1, and Feb. 1, 1902, by Districts.

District.	January 1. No.	January 1. Weekly Capacity.	February 1. No.	February 1. Weekly Capacity.
New Jersey	3	3,018	3	[illegible]
Spiegel	3	535	3	[illegible]
New York	2	1,275	2	[illegible]
Penna—Lebanon Valley	9	6,962	9	[illegible]
Lehigh Valley	18	9,637	19	[illegible]
Schuylkill Valley	11	8,700	11	[illegible]
Susquehanna Val. Upper	2	1,360	1	[illegible]
Susquehanna Val. Lower	8	6,358	7	[illegible]
Total	56	37,845	55	[illegible]

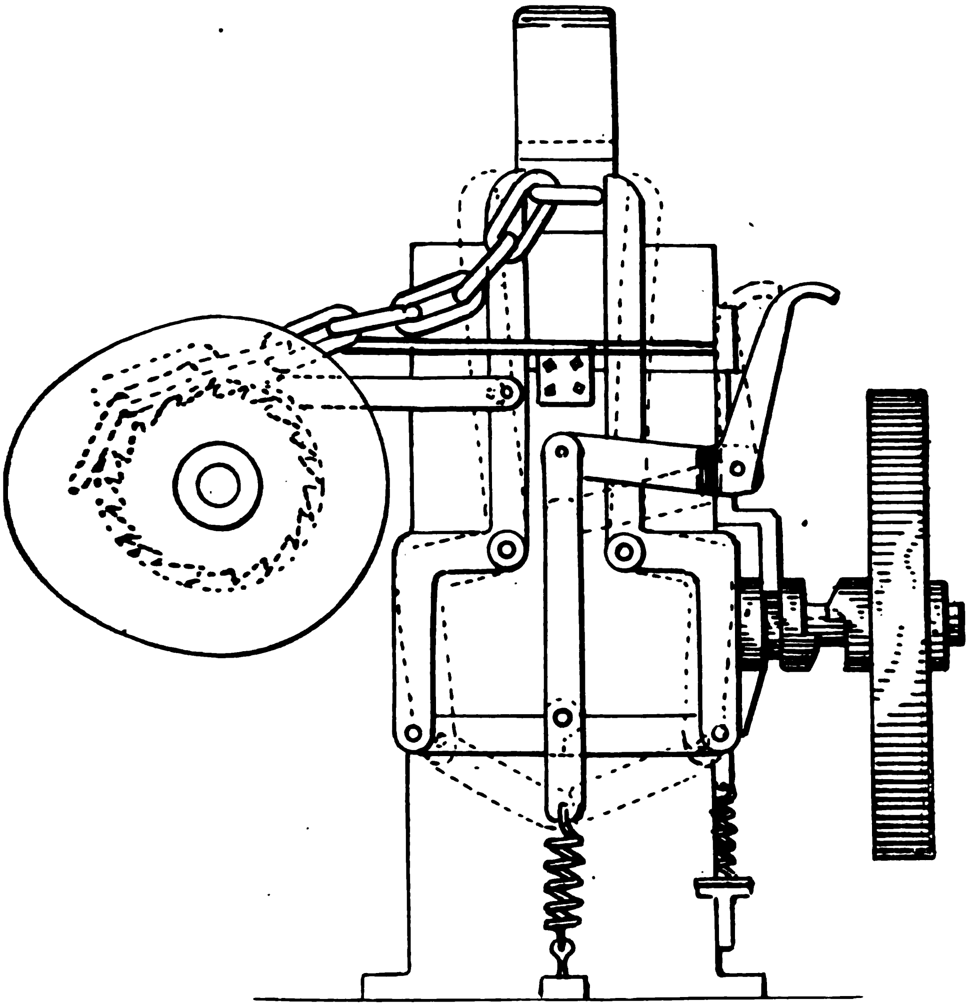
Bituminous and Coke Furnaces in Blast Jan. 1, and Feb. 1, 1902, by Districts.

District.	January 1. No.	January 1. Weekly Capacity.	February 1. No.	February 1. Weekly Capacity.
Alabama	6	25,459	25	[illegible]
Colorado	3	3,750	2	[illegible]
Georgia	0	0	0	
Illinois	16	32,602	16	[illegible]
Kentucky	4	1,680	4	[illegible]
Maryland	3	5,500	3	[illegible]
Missouri	0	0	0	
New York	4	5,618	4	[illegible]
North Carolina	0	0	0	
Ohio—East'n, Cent. & Nth'n.	14	22,581	20	[illegible]
Hanging Rock	10	6,157	10	[illegible]
Hocking Valley	2	695	2	[illegible]
Mahoning Valley	11	24,769	13	[illegible]
Pennsylvania, general	5	5,698	5	[illegible]
Juniata & Conemaugh Val.	9	11,798	9	[illegible]
Pittsburg district	29	74,119	31	[illegible]
Spiegel	1	2,512	1	[illegible]
Shenango Valley	1[illegible]	22,859	16	[illegible]
Tennessee	11	7,317	11	[illegible]
Virginia	13	7,967	15	[illegible]
West Virginia	3	3,958	2	[illegible]
Wisconsin & Minnesota	2	2,000	3	[illegible]
Total	18[illegible]	267,239	192	[illegible]

The Burn Uniform Steel & Metallic Company will apply for a charter March 5. The incorporators are Ross White, 823 Mellon street, this city; James Burns and James W. Byrnes, also of this city.

THE NEW STANDISH CHAIN-MAKING MACHINE.

A. S. STANDISH well known as the inventor of chain making machinery has added to his work a machine just patented which he claims is a decided advance over former machines. The new chain maker will be ready for the market shortly when manufacturers in that line will have an opportunity for instituting comparisons. While the machine has much in common with that class of apparatus, Mr. Standish claims the completed mechanism will show that it possesses merits exclusively its own. The accompanying illustrations, reproduced from the original drawings by Mr. Standish will make plain to chain machine employers the general and detailed construction of the latest production.

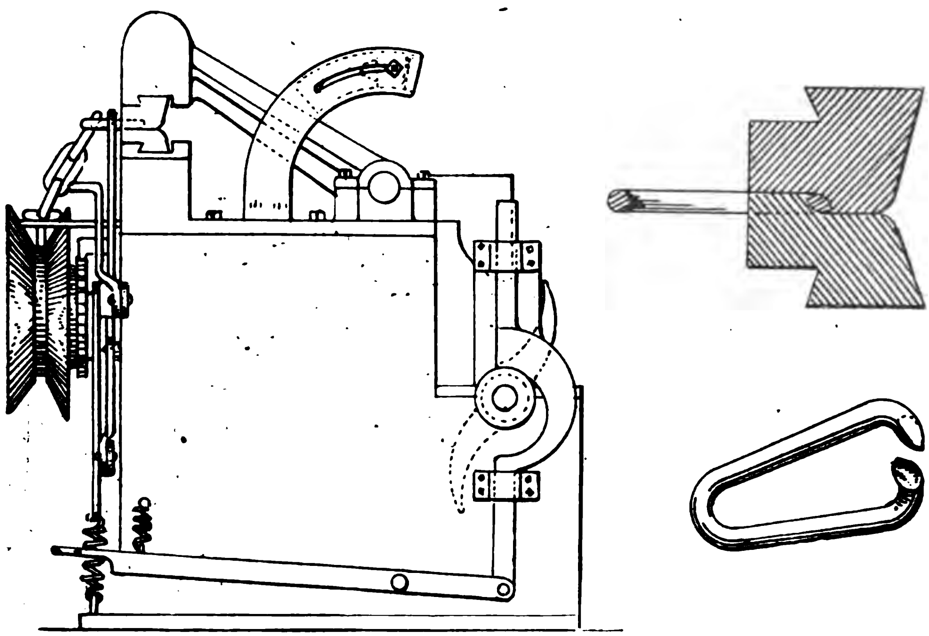


Front elevation Standish New Power Chain Hammer.

In Figure 1, the front elevation, is displayed the several essential working parts, the dotted lines making clear the operating movement as separate from the position at rest or between blows of the trip hammer. Users of chain making machinery will

see at a glance the essential departure from apparatus in common use. The head and the top of the trip hammer in the center of the diagram at the top will attract attention at once. Those parts, with the shive wheel shown at the left of figure 1, and the lever shown at the right in both drawings constitute the new features in chain making machines. The dove tailed groove shown under the head of the hammer in figure 2 is another new feature, which, with a rubber rest for the hammer when thrown up, shown at the movable end of the hammer shaft, completes the improvements.

In operation, Mr. Standish claims that the new machine will not only produce more chains, but a product much superior to that commonly marketed. The gain is made in the operation of the trip hammer and its complementary parts. The gravity blow of existing machines is supplanted in the improved apparatus by a blow which may be regulated at will by the manipulaton of the lever shown at the right of drawing of both elevations, the dotted lines in figure 2 indicating the scope of motion. The welding of the links is thus much more rapid than by the old method, the blows



Side Elevation Standish Power Chain Hammer.

of the hammer falling with the desired frequency and power upon the links while at the best welding temperature.

This is believed to be the only trip hammer with belt transmitted power capable of stricking a blow regulated to a hair by the touch of the operator upon the lever. The closing and welding of the links is thus seen to be under the control of the workman at all times moving rapidly or slowly at will. One of the advantages in the finished products is that all the links have straight sides instead of the usual oval form. The links are held absolutely straight and the instant the workman removes his hand from the lever which closes the link, the pawl which rests upon a ratchet wheel, fastened to the shive wheel over which the chain passes, the chain moves along one link holding the chain perfectly straight and at the same time moves it out of the chain maker's way.

The smaller diagrams in Figure 2 show the appearance of the link and a sectional veiw of the die in which is inserted a section of link.

Recent Inventions.

A NEW process and apparatus for making pig iron has just been patented by John A. Potter, of Camden, N. J., to obtain iron low in metalloids, and suitable for steel making in the open-hearth process.

The apparatus has an annular hearth mounted upon bearings, provided with anti-friction balls interposed between the annular casting which forms the base of the hearth, and a supporting track. The furnace is set at an incline, one side considerably lower than the other. A roof of annular form is supported above the hearth by means of beams projecting from a central stack. Tie-rods are provided, which connect the upper portion of the stack to the outer parts of the beams, and made adjustable, that the level of the roof may be changed as desired, and for the same reason the roof is preferably supported from the beams by means of adjustable hangers. The roof is hollow throughout a major portion of its length and at a point near the lowest side of the furnace is provided with a partition, on one side of which are provided gas-ports, and on the opposite side air-ports, both sets opening downwardly upon the hearth. The air enters through a port on one side of a depending roof-shield and flows through the hollow roof to the air-ports. The gas is supplied through a port adjacent to a vertically adjustable depending diaphragm and flows thence through the hollow roof to the gas-ports. The stack-flue leads upwardly from the hearth and through the hollow roof to the stack, and between it and the charging openings is a vertically sliding depending damper or diaphragm. Both of the diaphragms are preferably made hollow and are water-cooled. They may be raised or lowered and serve to cut off the draft from those parts of the hearth beneath the charging openings. The hearth is rotated by means of any suitable connections.

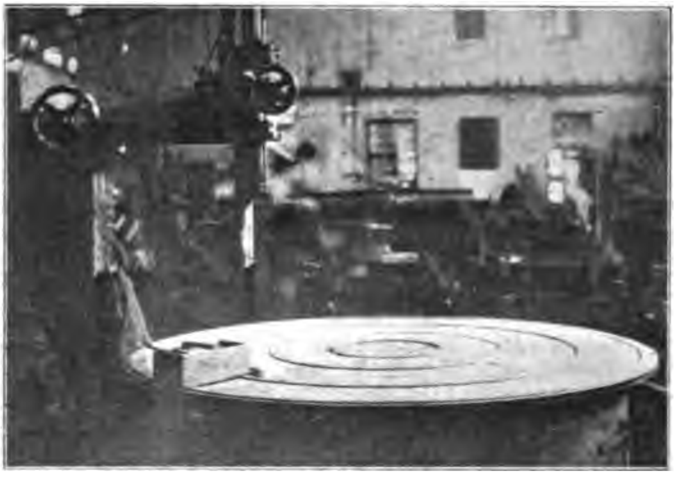
In carrying out the process the bottom of the furnace is formed of ordinary refractory material, such as magnesite or dolomite, and the furnace is heated by means of the pre-heated air and gases, which enter the hearth-chamber at the gas and air ports near the low side and then circulate around to the stack-flue. In starting the furnace, a quantity of pig-iron—say two or three tons, is charged, after which a thin layer of carbonaceous and lime materials—such as coke-dust, fine coal, charcoal, limestone, etc., is introduced this being discharged upon the bottom immediately in the rear of the pig-iron, and as the bottom of the furnace is moved forward, there is charged upon the carbonaceous and lime materials a layer of iron ore of any desirable thickness—for example, six inches. The furnace bottom is then turned forward intermittently, and charges of carbonaceous and lime materials, together with layers of ore, are successively charged upon the successive portions of the hearth which are brought beneath the charging openings. The pig-iron is gradually heated, and when it reaches the hotter zones of the furnace it melts, and envelops, covers, and dissolves the highly-heated iron ore charged in the rear of it. It will be noted that before the iron ore is thus absorbed it will have been slowly rotated into hotter zones and largely freed from its moisture, sulphur, arsenic, etc., by its exposure to the oxidizing conditions during its travel from its charging opening to the reduction and melting zone.

As the furnace is again turned the liquid metal will flow over and cover another portion of the ore which sticks to the bottom of the furnace and is carried beneath it, and after the ore is dissolved the carbonaceous and basic materials charged under the ore are set free and will rise up and into the liquid bath. The carbon will then be absorbed by the liquid metal, while the lime will associate with the silica and phosphorus, etc., in the ore and form a basic slag. The carbon thus added to the hearth will replace the carbon of the pig metal which has been consumed by uniting with the oxygen of the ore. As the liquid becomes increased in bulk a portion of it is drawn off from time to time, as desired, as is also the slag, and the operation is made continuous by carrying successive portions of the basic material, carbon, lime, and ore into and beneath the molten bath and tapping off portions of the bath as it increases in size. The hearth after it passes through the bath will be substantially bare and will be again supplied with the materials at the charging points. The carbon is utilized to combine with the oxygen in the ore as it washes over and submerges the successive portions, and to keep it up to the desired percentage necessary to carry on the reduction and keep the bath liquid the carbon is added to the materials charged in any desirable amount.

MACHINE MOLDED GEAR.

MOLDING by machinery is supplanting molding from patterns wherever feasible. Molding by machinery is more accurate, since nothing has been invented to prevent wooden patterns from warping, while iron patterns will frequently spring. When a machine is adjusted properly, all the castings will be the same provided the molding is uniform and due care is taken to use the proper style of flasks. Machine molded gears are rapidly replacing gears made from patterns, and the machine made gears are as nearly accurate as rough cast iron can be made.

Among the simple contrivances intended to mold gears is a machine used at the National Gear Wheel & Foundry Company's plant, Allegheny. It was invented by Ferdinand Kepp. He worked about five years on the machine but did not seem to be able to introduce it successfully for lack of capital. His small plant in Allegheny was sold out and John Nusser, of Pittsburg, became the owner of the invention, November 26, 1899. The machine has been operated successfully since Mr. Nusser invested his money in it, and the demand for machine molded gears has been increasing ever since.



Molding Machine used by National Gear Wheel and Foundry Company

The molding machine consists of a circular table which can be revolved. On this is placed a circular flask with an extension on the under side to hold the sand in place. This circular table is regulated so that in making a circle it can be set to the hundredth part of an inch, and does not vary. An upright column supports an arm which extends part way over the circular table, or to the center of it if necessary, as the arm is movable backward and forward. The arm has an upright attachment movable, like the spindle of an upright drill press, except that the movable part on the molding machine is dove-tailed or oblong, instead of round. A wheel and rack gear is used to raise and lower it. On the lower end of this upright the pattern of one tooth is fastened. The pattern is of wood, shellaced on the inside where it comes into contact with the sand. The remainder is left rough and unfinished.

When the table and arm have been set at the proper sweep, the single pattern for a tooth, which is really an inverted pattern, or the female part, is lowered to the proper depth, also marked by a gauge, and the molder rams the sand inside the tooth, close to the flask using a liberal supply of old nails to hold the sand in position. When the tooth is completed, the molder raps the pattern on the back part or inside of the mold, and, turning a wheel, the pattern is forced outwardly leaving the molded tooth exposed. The circular table is turned in position for the next tooth, the pattern moved back in place, and each tooth is rammed in turn separately.

It might appear to the molder accustomed to using a pattern that this system is slow. On the contrary, the molder makes greater speed in this manner than he would make with a pattern, because when once the teeth are completed there is no hand work to be done in dressing the sand.

When the teeth of the gear are molded, the circular flask containing the molding is lowered to the floor by a traveling crane. Here the arms, hub and interior circle of the gears are put in place. These are made of baked sand cores, each made in the shape of a core box, instead of a regulation core. and are soon placed in position. The pouring is done from the hub, holes being made in the core for that purpose.

The rapidity with which this work can be done is a decided improvement on the old method of making gears from patterns. Thus, this shop made a gear 156 inches in diameter weighing 21,500 pounds, in one day. The accuracy of the wheel proved to be its valuable feature. A pattern had been left at the shop from which this wheel was to have been made. By actual measurement the pattern had warped three-eighths of an inch and was untrue more than one fourth of an inch. This would have been magnified in the molding and the wheel would have had to have been turned and re-cut to have been of use. The gear molded by machinery on the other hand was absolutely true, and proved as good as a turned gear when placed in position.

Gear Teeth Mold, Machine Made.

The illustrations were taken inside the foundry and show the gear molding machine standing cleaned up and idle. It is understood that the inventor later built similar machines which are in use in other shops in Pittsburg and there has been some talk of infringement suits. The second illustration shows the teeth of the gear after being formed on the machine and lifted to the molding floor. These machines have been used on gearing from six inches to 17½ feet diameter. The machine is especially valuable on helical and bevel gears, as no draft is necessary, making smoother running gear and one that does not need to be machine finished.

Some improvements remain to be made on the machine, notably in the handling of the sand. The workmen have been allowed to use the old custom of filling the sand by hand, whereas, a hopper filled with well mixed sand with a spout leading to the molder might be used with profit and advantage. The workmen maintain that they must feel the sand as it goes into the mold, but this is not considered necessary in the largest shops in the country, where the molders have been taught otherwise. It will take some time, however for the smaller concerns to become acquainted with all the labor saving methods, especially when workmen are prejudiced to fight innovations.

IN foundry work it is often desirable that the castings should be marked in some permanent way with a number or letter indicating the heat of the furnace from which the metal for the casting is taken and the date of the heat; but frequently the proper heat number cannot be known until the casting is made and the forming of the figures or letters in the sand of the mold is rendered practicable.

John J. Carroll, of Cleveland, has devised a means by which the marking of the castings can be effected simply and efficiently and the marking symbols changed at will at any time prior to the pouring of the metal. It consists in providing the same mold in which the casting is made with a type box or case, which is placed with its inner open end flush with the matrix cavity and adapted to receive removable types, which have been set to present as part of the wall of the matrix the figures or letters against which the metal can be cast. In preparing the mold to receive the metal the types can be placed in the box in readiness for the casting; but if prior to the pouring it becomes desirable to change them, any of them can be removed and replaced very quickly and without inconvenience. The patent has been assigned to the National Malleable Castings Company, of Cleveland.

THE ENLARGEMENT OF THE SAULT CANAL.

BY WALDON FAWCETT.

A PROJECT which means much to the iron and steel industry in the United States, to copper mining and marketing interests, and, indeed, to a considerable portion of the American manufacturing world in general, is found in the proposal to enlarge the locks of the governmental ship canal which connects Lakes Huron and Superior and forms the water gateway to the rich iron and copper mining districts of the Northwest. The planned reconstruction of the locks is in the nature of an enlargement of capacity and it is in character but a repetition of previous actions which constitute epoch marking milestones along the pathway of progress. As the movement of raw material from mines to furnaces has grown and extended, in full

The Soo Lock.

proportion there has been a development of the traffic passing though the canal at Sault Ste. Marie and necessarily a corresponding increase in the utilities of the artificial waterway.

The history of the Sault canal has been in a measure an epitome of the growth of iron and steel manufacturing interests in this country. When the original canal was constructed the scheme was undertaken as a state work by the legislature of Michigan. Naturally several years of agitation preceded the actual commencement of work and it is significant of the rapid growth of the commerce of the great lakes that although the original canal as finally constructed was nearly four times as large as had been contemplated by its projectors a few years before, it still proved within a very brief space of time to be totally inadequate to the demands made upon it and there was presented the necessity for an enlargement of both locks and canal. This resulted in the transfer of the canal to the jurisdiction of the national government which has been responsible for the construction of the locks at present in use.

The close of the first year of the new century again finds the locks of the waterway at the Sault closing upon the heaviest traffic in the history of the great lakes, thereby emphasizing the necessity for an extension of the facilities of this connecting waterway. The preliminary statistics which have been prepared give promise that when the full figures for the year are at hand they will show that there has been moved through the Sault canal during the navigation season of 1901 a total of upward of 30,000,000 tons of freight. To appreciate the true significance of this enormous aggregate it is well to take into consideration that a year ago the traffic passing through the canals footed up about 25,600,000 tons and that during the year 1899 the total did not greatly exceed 24,500,000 tons. Perhaps the bounding development might be even more forcefully portrayed were a comparison made with the year 1881 only two decades ago—when the whole traffic through the canals at the Sault amounted to only 1,500,000 tons or with the record of the year 1891—a short ten years since—when the footing of the season's movement was but 8,800,000 tons.

Whalebacks in the Lock.

The figures for the last three years show very conclusively, too, how great a factor the iron and steel manufacturing interests have been indirectly in the evolution of conditions in the territory the major part of whose products seeks the world's markets through the open doorway at the entrance to Lake Superior. Incidentally the figures offer conclusive refutation of the claims that the resources of the Northwestern iron deposits are sorely drained. Because the major portion of the iron ore is transported prior to November 1 each year, it is entirely permissible to base a comparison on the figures covering the period prior to that date in each year. In 1899 the movement of iron ore up to the time indicated was 13,307,099 tons; in 1900 it was 15, 255,038 tons; and in the present year it amounted to 16,283,109 tons—a gain of more than a million tons over a year that was phenomenal in every respect and the mere duplicating of whose movement would have been regarded as a very creditable achievement.

There could be no stronger argument for the increase of the size of the locks of the Sault Ste. Marie canal whenever such increase is necessary or advisable than is

found in the fact that the extension of the facilities of this waterway has ever been a pioneer for development—always a growth and not infrequently a cheapening influence which has been quite as important in its effect. It has been truly said that without the "Soo" locks the history of American iron and steel and kindred industries which are dependent upon cheap and plentiful coal and ore would have been very different from what it is. It is indeed not improbable that without these locks the present industrial supremacy of the United States would have been postponed many years. The relation of low transportation costs on the great lakes to cheap iron and steel is very direct and apparent and the responsibility of the Sault canal in enabling the establishment of minimum carrying charges is certainly not more remote.

Every deepening of the channel or enlargement of the locks of the Sault canal has been directly followed by a corresponding increase in the size and carrying capacity of the cargo vessels of the inland seas. When, about the middle of the century, the original canal had a depth of but ten feet of water on the sill, the largest vessel on Lake Superior did not exceed 600 tons burden. After the opening of the eighteen foot lock in 1881 the maximum capacity of the freighters speedily rose to 2,500 tons and when in 1896 the twenty-one foot sill was introduced it permitted a still further increase in size and dead weight carrying capacity. This increase has been beneficial to the iron and steel interests in more than one way for the ore-carrying vessels are now operated by the manufacturing interests directly and a doubling of the capacity of the boat has entailed an increased expenditure of only twenty-five per cent for operation.

The benefit which the canals have conferred upon the manufacturing interests is not to be measured, however, by the accomplishments in the line of a cheapening of production. Lower transportation charges for the finished product and for fuel also play an important part. To the furnaces in the vicinity of Chicago and to manufacturing interests generally in the West, cheap coal has meant almost as much as has cheap iron ore to kindred industries in the East. That the transportation of the finished product also enters into the situation is evidenced by the fact that during that part of the present season prior to November 1 there was transferred by water from lower to upper lake ports an aggregate of more than 120,000 tons of manufactured iron.

Of the advisability of an enlargement of the present locks there does not appear to be much diversity of opinion among the best informed shipping men on the great lakes. The smaller of the two locks at the canal constructed and operated by the United States government is over five hundred feet in length and of about one-sixth that width. It cost approximately two and one half million dollars. The larger locks which represents a governmental expenditure of over five million dollars is over eight hundred feet in length and has a breadth of one hundred feet. Of course, it is planned to have several vessels lock through simultaneously this contributing greatly to an economy of time.

The plea has been advanced in some quarters that in view of the present tendency of lake navigation interests to return to the policy of constructing freight-carrying vessels of more moderate size—substituting the 400 foot freighter for the 500 foot craft introduced a few years since—there is not the urgency of need for enlarged locks which existed some months since, but the fallacy of this theory is readily proven since whatever be the size of the vessels additions are constantly being made to the lake fleet and the enlarged locks are sought for the accommodation of more numerous vessels, not to permit of the passage of larger ones.

A saving of time in lockage would be a possibility of enlarged locks. At present an average of about one hour and ten minutes is required for the passage of a vessel through the locks and canal which is by no means extravagant in view the fact that the canal is one and three fifth miles long but if this interval can be reduced shipping interests generally will, of course, be the gainer. Still another consideration is found in the advisability of having the American canal in a position in case of emergency to handle the entire traffic passing the Sault. At present the Canadian canal passes only eight per cent of the total freight moved through the canals but there is no doubt that were this added to the volume of traffic now going through the American waterway the increase would be appreciable from the standpoint of the consumption of time in lockage.

Gas and Gasoline Engine Ignition.

BY ALBERT STRITMATTER.

Continued from page 168.

PREMATURE ignition in engines may occur from the incandescence of a small nut or sharp corner in the cylinder, or something of that kind. With hot tubes the point of ignition varies according to the atmospheric pressure and therefore if the ignition takes place at a proper point today, it may not do so tomorrow. Further than this, an engine with a tube igniter may be igniting at the proper point at the factory when it is tested, but the point at which it is used may be of much higher or lower altitude and thus cause the ignition to occur early or late owing to the different atmospheric pressure. With electric igniters premature ignition may occur from some part getting out of adjustment, or from wear on some piece.

Premature ignition, however, must not be confused with the "lead" of the ignition. By this is meant what was referred to before in regard to the ignition taking place before the crank has reached the dead center. This lead must be allowed in order to give the mechanism a chance to operate and the charge time to be thoroughly ignited by the time the crank reaches the dead center.

On the other hand, late ignition, while not so disastrous to the engine itself as premature ignition, is just as effective in reducing the power of the engine. The power developed by any engine depends on the compression at the instant of explosion. If the psiton reaches the farthest point on the compression stroke and starts out on the expansion stroke before ignition takes place, the compression decreases, resulting in an equivalent decrease in power.

As a matter of fact, the majority of troubles with gas engine igniters are due to lack of attention, just as is the case with troubles with other parts of the engine. Of course, the more delicate the igniter is the more attention it needs. An illustration of this came to my attention lately. In a large dry goods store there are located two engines used for operating elevators. I had heard for some time that the engines were giving considerable trouble and were shut down most of the time, and that unless they soon gave different results they were likely to be thrown back on the manufacturer's hands. Sometime ago, however, the owner of the engines employed as an engineer a man who had worked some in a gas engine factory. While he had not been employed as a machinist, he had considerable knack in picking up information and when he took charge of the engine, which was of a different make than that made in the factory where he had previously been employed, he began to study the igniter very carefully. He soon found that unless a certain adjustment was attended to carefully the engine failed to ignite. As soon as he found out what the trouble was he studied to see how the adjustment should be made. Since he discovered this the engines have given no trouble and have never shut down once except when he has stopped them. Here was a case such as every gas engine manufacturer meets with frequently. Two engines of a good make were giving trouble of the worst kind. And simply because the operator did not understand an adjustment that had to be looked after. A new engineer is placed in charge and different results are secured at once, solely because he studied the engine and located the trouble instead of tinkering with this or that part in an aimless sort of a way. Take many a gas engine operator and watch him try to start his engine. If he fails, ask him why it did not start. Probably he will look at you with a blank expression and then say he doesn't know. What kind of success is he going to have? It is, or should be, his business to try at least to learn why an engine does not give successful results, if it does not, and then do what he can to remedy the troubles.

This applies to the igniting mechanism as much as to any other part of an engine. The man who has trouble and simply sits around saying he doesn't know why the engine doesn't run, or waiting for a man to come from the factory, is sure to have trouble all the time. If he were in charge of a steam engine and boiler he would soon have an explosion, but having charge of a machine which Providence and the designer have wisely so made as to take care of him (instead of his taking care of it), the engine simply shuts down and the operator "doesn't know why."

THE SURPLUS PRODUCT VIEWED IN ENGLAND.

ENGINEERING, LONDON.

COMMISSIONS and committees of inquiry in the United States often follow methods of procedure which appear somewhat strange to British eyes. The Federal Industrial Commission has recently issued a special report based upon data received in reply to circulars of inquiry issued to a large number of American manufacturers. The object of the circular was to ascertain whether there was any truth in the allegation, frequently made, that American manufacturers sell their products to foreign purchasers at prices lower than those charged to native customers.

The question is one that closely interests British manufacturers, especially those engaged in the steel trade or other industries in which the product is large and involves the keeping up of a big establishment. The Commission communicated with over 2,000 firms, the scope of whose operations extended over a wide field of industry. and twelve questions were put to each person or firm addressed. The substance of the chief points brought out in the answers is given in the Commissioners' report, but in every case names are suppressed. This method of obtaining information has its drawbacks, but an excuse for the procedure is that information is thus forth-coming which could not otherwise be obtained at all. The matter supplied seems often to bear evidence of the bias of the contributors; and whether it is worth while giving an official complexion to annonymous views of this nature is a matter which may be open to discussion. The Americans, however, often display a boldness and freedom from conventionality in the conduct of official business which is well recognized, and it is well understood that the value of these publications should be appraised according to the circumstances under which they are compiled, the officials trusting to the shrewdness of the American public to allow any reasonable discount that may be needful before the views put forward are accepted for use.

The two most important questions put by the circular were whether the recipients were in the habit of selling to foreign markets at lower prices than those charged at home; and, if so, what was the reason. Opinion was also solicited as to what course would be suggested to secure for home customers equality of price with that charged in foreign markets by the same producers for the same goods.

For some time past an increasing feeling of dissatisfaction has been growing up in America at the prospect of the working of the "surplus product" system. As our readers are aware, the policy of a number of American owners of large factories is to keep their establishments fully employed in times of depression at home by selling the surplus of production, in excess of that required for home use, to foreign purchasers at prices, if necessary, below those charged to the American purchaser. In this way the home market will be sustained at a pace that will supply a profit, even though there may be none on the foreign sales. It will be evident that this "principle of the surplus product" can only be carried out in a country that maintains a protective tariff. It is difficult to understand how the American consumer is not to be at a disadvantage.

The big trusts and combines are the great upholders of this system, and it is probably that which has chiefly led to their growing unpopularity, to which we have already alluded. Although the replies to the Commissioners' circular were doubtless penned before the latest developments of the big trust movement were made known to the public, yet one can almost fancy one recognizes a desire on the part of manufacturers to meet public opinion in this respect.

Although a good many of the answers of those addressed by the circular would lead one to suppose that the prices obtained by the American manufacturer from abroad are as high as those ruling in the home market, other witnesses acknowledge that the rule of the surplus product is in operation. To whatever extent that may be so at the present time, we may be sure the system will be far more extensively followed when the power of production exceeds home demand to a larger extent. Various

reasons are given why lower prices are accepted for export orders than for domestic supplies. Some of the manufacturers say that the reason by which they are governed is simply to swell output. The foreign demand enables the production to be so increased that the cost of manufacturing is greatly reduced, and in this way the home consumer gets a benefit. If a works, by aid of foreign orders, makes 2,000 tons of steel, whereas the home market would only demand 1,000 tons, and the 2,000 tons can, naturally, be made more cheaply than the 1,000 tons: then, even if no profit is made out of the foreign trade, the home demand can still be supplied at a lower price than would be possible if the smaller quantity only were produced. This is a very pretty argument, and no doubt it may be logically advanced to prove that the world at large would benefit by such a transaction; but the policy would aim a serious blow at the foreign trade of any country following such a course. For instance, if plates and angles of American make were sold in England at a lower price than in the United States, it is evident that British shipbuilders would be in a position to underbid American shipbuilders in the markets of the world, even supposing all steel were made in America. It cannot be denied that the larger output due to the surplus product system would enable the American maker to produce steel for the home market at a cheaper price than would be the case if he made in smaller quantities; and so far the American consumer might profit, though that would be by no means certain; but how much more advantageous it would be to the country to reduce prices by throwing down the barrier of protective duties, thus giving the American shipbuilder the advantage of American steel as cheap as the European could buy it and thereby assisting him to compete in the markets of the world.

The old plea for a prohibitive tariff—that an infant industry needs protection—no longer applies to the steel trade of America. Rich ore, cheap coal, and the wonderful way in which native enterprise and ingenuity have developed the steel making resources of the country, placing their works at the head of those of all the world, make it ridiculous to urge that American steel makers need protection. It may have been wise for America, beginning with a fundamental industry, years ago to have protected steel makers against British assault, and, taking only a single instance, thus to have sacrificed for a time the chance of a foreign trade in shipbuilding. Now that the steel industry is no longer an infant, but has reached the proportions of a giant, over-topping its fellows in all other parts of the world, the swaddling clothes of protection have become absurd.

We are conscious these arguments may be used against our own interests; and, so far as British prosperity is concerned, if the United States will supply us with steel at cost price or half cost price, forever, this country can ask nothing better; unless it were they should supply it to us for nothing at all; a pitch of altruism to which even the "surplus product" is not likely to attain. As we have pointed out on a former occasion, however, we must be careful that the surplus product system is not ~~continued only~~ just enough to kill our native steel industry. In that case we should be quite at the mercy of the foreign producer, who would, doubtless, show no more consideration for us than for his fellow countrymen. Again, it may be that, owing to the natural riches of the country, America is destined to have the steel trade of the world in any case—there are American steel makers who hold this view—and in such an event we can only pray that the United States will continue the surplus product policy for all time. These are some of the aspects for and against the policy from the standpoint of British interests. For our own part, reviewing so far as possible the chief facts of the case—and being by no means of opinion that British steel makers are as much at the mercy of American competition as some would have us believe—we look on the surplus product in the light of an imaginary "gift from the gods," and we should be as simple as the foolish Trojans were we to welcome it within the walls of our citadel. Whether we can do anything to keep it out is another matter. A Free Trade policy, wisely or not, throws down our chief barrier, and blunts the one weapon of defense.

We say " wisely or not," because we remember that England does not stand alone as a possible market for American steel. Even if we denied our manufacturers its use, the surplus product might be sold to other countries—some, perhaps, our

competitors in shipbuilding and other steel-using industries—and we should thus possibly throw aside an advantage that might only be too eagerly seized by others. The whole argument is, of course, based on the assumption that American steel is sold in European countries at cheaper rates than it can be made by them. We form no conclusions; the case is too complicated by an obscure future; there are too many uncertain factors and unknown quantities. We merely put the matter in different lights, viewing it from various standpoints as they occur. If, however, there is no conclusion that appears more obvious than the rest, it is that the policy of the surplus product in steel making can hardly be to the advantage of the American people; so long as it lasts.

Some of the manufacturers who reply to the Commissioners' circular state that the difference in price of American goods in favor of the foreign purchaser is far less apparent in the present day than it was in past years. That may be true; but it must be remembered that for some time United States manufacturers have been experiencing a period of altogether unprecendented home demand, and the surplus product system is only intended for times of domestic slackness. In those cases in which it is acknowledged that foreign rates are lower, reasons are given, many of which remind us of the excuses offered here at home by British shipowners and railway companies for favoring foreign goods in the matter of transport. Foreign orders, those who reply to the Commission's circular say, are in larger bulk than those of the home market. The transactions are made with merchants or agents who pay cash promptly, and who take all the minor worries of the business on their own shoulders. Distribution is arranged for by the middle man; packing in small quantities, he undertakes also the payment of freights, of customs duties, and many other services which are not only troublesome, but costly.

Putting forward these considerations seems a little like begging the question, and the answers emphasize the defect of inquiry by circular. The real question at issue is whether the foreign consumer gets the article at a cheaper rate than the native user. Does the American manufacturer allow an excessive margin to the middleman, and so enable the latter to supply American goods to the foreign user at prices lower than those charged to the American user? Some of the witnesses answer this question in the negative; but, if this be true of the business at large, facts have been very much distorted of late, and some American manufacturers have failed to carry out a declared policy.

Others who have replied to the inquiries of the Commission say that they have accepted lower prices in order to compensate for tariffs of other countries—a reason that may arouse mixed feelings in the minds of both Free Traders and Protectionists. We have here a somewhat complex problem. A country—in this case the United States—protecting its manufacturing industry by a prohibitive tariff, with the not unexampled result that the native consumer pays the taxes of a foreign state. Supposing, for instance, Montreal takes 1,000 tons of steel from Pittsburg. The price the Pittsburg man would charge his own countrymen would be, say, \$50 a ton. But there is a Canadian duty of, say, \$5 per ton, so the Pittsburg steel maker charges but \$45 to the Canadian purchaser, and recoups himself by an extra charge to the home user.

Here are arguments for and against Free Trade: for and against Protection. The Canadian protectionist says: "See, we get our taxes paid by the United States!" That is in favor of Protection, but the United States Free Trader will say, 'Look how protection is ruining the country. Our prohibitive tariff keeps out foreign competition, and enables our steel makers to force the United States consumer to pay Canadian taxes!" Of course, the principle may be reserved on some other transaction, and in the meantime the consumer in a third country, where there is no protection, may be getting steel at \$45 net and so, for a time, may undersell both the American and the Canadian in a neutral market. But only "for a time." One of the reasons for the adoption of "surplus product" methods given in the answers to the circular was that in order to establish a foreign market lower prices were accepted abroad in order to oust the native manufacturer. After the market had been captured, prices could be raised.

Only a few of the replies to the circular state bluntly and without excuse that

they sell more cheaply abroad than at home because foreign prices are lower, and that they can only do business on these terms. Cash payments for exported goods—as compared to long credit and possible bad debts in America—and the cheaper labor of Europe are frequently advanced as reasons why prices are lower on this side of the Atlantic. It is difficult to reconcile the latter statement with the constant boast of America that, though higher wages are earned there, yet the workman of the United States is so superior in efficiency that his energy and skill more than compensate for the extra money paid for a day's work. Another reason given for low prices for export is worth notice. There is a drawback on imported raw material which is worked up in the United States and then again sent abroad. This provision appears wise and liberal. It is rightly assumed that there are certain classes of raw material that can be more cheaply made and sold by other countries than they can be procured in America.

The Americans are anxious to cultivate a foreign trade, but if their manufacturers have to pay a heavy duty on some items of raw materials, they cannot expect to compete with those—ourselves for instance—who get that particular class of goods duty free. Hence the return of duties paid, which seems equitable enough. A certain amount of trade is brought into the country that would otherwise be missed, and no one loses anything. If, however, we look closely, doubts may arise as to the wisdom of the measure. It will appear that the lower price charged by the American exporter to the foreigner enables the ultimate purchaser—probably a manufacturer—to produce his wares at a rate below that of the American manufacturer of similar articles; and thus American trade suffers. For example, fine steel can be bought from Sheffield at a lower price than it can be procured in the United States. A New England toolmaker may import, say, a ton, paying duty, and may make it into small tools. One half of these he sells at home, charging the enhanced price necessary to cover the duty; the other half he exports to England, charging a lower price, and getting the greater part of the duty refunded by the customs authorities. It is evident that the British users who purchase the tools will be so far in a better position than their American competitors, and other things being equal, will keep the latter out of neutral markets.

The whole inquiry illustrates the vast complications of the subject, and how easy it is to adduce or refute arguments for or against a Free Trade or a Protectionist policy respectively; and it is upon a prohibitive tariff that the system of the surplus product depends. If we leave theory and turn to practice, we are equally at a loss. During half a century of free trade Great Britain has built up a commerce the extent of which other countries have never yet equalled; but, on the other hand, during a much shorter period of time, the United States, with a rigid system of prohibitive duties, have established branches of industry which in some cases have already outrivaled out own; whilst in many others they are fast reducing the lead we hold. In Germany, too, another protectionist state, the same conditions appear, though to a less marked degree. Of England it may be said, in accounting for our success, we had a long start in the industrial race. We were in the happy position of being able to develop our industries earlier than all other countries. We made the first engines, the first steamships, the first railways, the first textile machinery, the first blast furnaces, the first open hearth steel, the first machine tools. We speak, of course, from the modern industrial, not from the historical point of view. We had Arkwright, Watt, Stephenson, Penn, Elder, Neilson, Bessemer, Whitworth, Nasmyth, and a host of other great men; together with the ardent workers that they collected round them and inspired by their example. (We also had Thomas, but he came in later days, and his brilliant work has been turned against us.) With these advantages it may be that the country would have prospered even had Cobden and Bright lost their cause.

On the other hand, America has had advantages that may have made her prosperous in spite of the protective policy under which she has grown so rich. There was the vast and rich extent of virgin country; the constant accession of young and vigorous manhood, which the older nations have been at the cost to rear, for the development of her resources; there are the great natural riches—coal, iron, timber, grain, and copper, in a profusion that no other country can boast of having developed. These things may have made America prosperous even though her fiscal policy may have been unwise.

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The Surplus Product.

The trade journals of Great Britain have turned their attention to the theoretic aspects of the problem of "the surplus product" system so far as it relates to the interests of the United States and Great Britain, with all the solemnity of the British mind. The editors have taken up the question where the more practical manufacturers laid it down temporarily when the competition of the American producers of every material, from raw steel to the most improved machines and tools, forced their attention in practice. True to the British habit the trade papers, as shown by the article reprinted from ENGINEERING, of London, are wasting their effort in attempting to show how the American producer and his employes are injuring themselves in the practice of the "surplus product system" as it exists today. The effort is similar to the labor exhibited when the British technical papers undertook to convince us how far wrong we were in the matter of manufacturing tin plates.

However the British mind may regard the problem, the American manufacturers are cheerfully willing to set the results of practice in the case against the conclusions of argument upon the theory. In normal periods our surplus product will not exceed two per cent, a proportion which should not frighten the oldest industrial nation of the world if all were shipped to England alone. The "surplus product" of the United States in times of industrial depression at home is the feature of the case that brings fear to the English mind. For, if the United States is able and willing in times of strong markets and high prices to ship cheap material to the other industrial countries, cheapening the values abroad, what may not be expected when the American prices are low and the "surplus product" great? Distressing as the case appears to the Britishers there does not seem to be any solution at hand which will bring a conclusion other than that America rules the world industrially, as to production and price, and will continue to do so indefinitely, and that England and all the world will receive our "surplus product" whenever it is offered.

The Price Bugaboo.

That the United States Steel Corporation will be kept occupied, at least temporarily, in holding the "boomers" in check is evidenced by the manner in which the press agents of the advocates of inflated values are operating in continuation of the threat that prices in iron and steel are to soar to the skies when the "famine" reaches us. A possible doubling in values is hinted but it is not likely that the hint will develop into anything more substantial. It is pointed out in an attractive way how easy it will be to advance all prices to the bursting point, but the Steel Corporation does not display any haste in adopting the suggestion.

To those who know that the greater per centage of the entire year's tonnage has been covered by contracts at last year's prices it is a trifle obscure how the possible doubling of prices is to affect the markets of 1902 dangerously. If the requirements of consumers had been left uncovered up to this time, and if the principal producer showed a disposition to hesitate in accepting orders, the ground for expecting a rapid and disastrous advance in prices would be more reasonable. But with the Steel Corporation books filled with business for nine and ten months in almost every department of production at the old rates, at the worst the advances in values that may come later in the year cannot reach more than that portion of the whole year's capacity at present not under contract. Add to that the other fact that the Steel Corporation will resist every attempt to force values even to the extent of buying up all the available material and turning it into the general market at the ruling quotations, leaving the speculators in the cold, and the danger does not appear to be so imminent.

Steel Hardening Process.

William Jessop & Son Company has sent out a circular giving details of the handling of a steel susceptible to hardening which will no doubt be favorably received. The description is on another page of this issue and while it seems to be valuable enough the steel can scarcely be considered self-hardening as the company states. The process will be seen to be one that could not be applied in ordinary practice to hardening steel but steel which must be treated so does not reach the strict idea of self-hardening steel. The process, however, will doubtless be well received.

Renewing Recommendations.

The second part of the report of the industrial commission renews the recommendations that promoters and organizers of industrial combines should be required to furnish full details of organization; that any announcement soliciting subscriptions which contains false statements should be deemed fraudulent and that the trusts should be required to publish yearly under oath audited statements, which shall be open to government inspection. The commission makes the additional recommendations that United States district attorneys be directed to institute proceedings for violation of the Federal anti-trust laws. That combinations and conspiracies in restraint of trade or production which by the concensus of judicial opinion are unlawful should be so declared by legislation uniform in all jurisdictions and as to all persons. and such statutes should be thoroughly enforced.

That stringent laws be enacted by congress and state legislatures making both penal and criminal the practice of discriminating between customers, and cutting rates or prices in one locality below those which prevail generally, for the purpose of destroying local competition, and that such laws should give to any person damaged the right to recover prescribed penalties, and make it the duty of prosecuting officers to proceed against the offenders. That to prevent over capitalization, the state legislatures enact laws similar to the anti-stock-watering laws of Massachusetts; also to provide for state supervision of all public service corporations, with power to recommend or regulate rates for service and to pass upon the public need, desirability or exigency of any proposed new service. That an annual franchise tax be imposed upon all state corporations engaged in interstate commerce, calculated upon the gross earnings of each corporation from its interstate business; that the minimum rate of such tax be low, but that the rate be gradually increased with increases in earnings.

A New Hardening Steel.

William Jessop & Sons, limited, of Sheffield, England, have introduced a new type of hardened steel, for which the advantages of uniformity and easy manipulation with the best working results in shop practice are claimed. Instructions for working are particularly simple and no elaborate process of hardening is required.

The tool to be forged is heated uniformly to a bright red, forged to shape and allowed to cool. To harden, place the nose of the tool in the fire and heat to a good white heat. Allow to cool away from the hearth, and thoroughly remove, by grinding, the thick scale which results from this high temperature. After the tool has been ground four or five times, to get the best possible results, it is found advisable to re-harden, without, however, dressing the tool in any way.

This steel has been thoroughly tested on cast iron, and steel forgings of all kinds, and the following is a typical test:

A marine shaft 12 inches in diameter, carbon 0.30 per cent, was put in the lathe. A 1⅛ inch square tool was used, with a cut of ⅜ inches, (that is, reducing shaft ¾ inches in diameter). Sliding feed was four to the inch, cutting speed 30 feet, (belting and lathe would not do more). Tool ran 24 hours before grinding. Weight of cuttings per hour, 80 pounds. Jessop's American headquarters are at 91 John street, New York.

Steel Car Wheel Plans.

An interesting development in the plans of the Schoen Steel Car Wheel Corporation, in process of formation, is reported in Pittsburg. The Pennsylvania Railroad Company, either as an organization or through stock to be bought by its officers, will figure as one of the leading principals in the new car wheel company. It is said that the Pennsylvania will practically control the output of the wheels and will have first call on them when they are made. Others interested are found in the official list of the United States Steel Corporation, and President Schwab is to be in the directorate of the new company.

At the time the plans for the Standard Steel Car Company works were prepared arrangements were made, it is said, for the location of the steel car wheel plant adjoining it. The idea now is to turn out the steel cars from the new Standard works, and fit them with the new steel wheels from the Schoen plant. It is also asserted the Schoen interests in the Standard Steel Car Company are pronounced and will be shown when the new corporation gets into working order.

The site selected for the plant at Beaver is awaiting the approval of Mr. Schoen before the final papers are passed. Mr. Schoen went to Philadelphia immediately upon his arrival in New York from Europe last Saturday and something definite may be looked for in a few days.

The Board of Public Service, Cincinnati, O., will receive bids until February 24 for the superstructure work on a single span deck bridge; and for three steel deck spans of 75 feet each.

IN AND ABOUT PITTSBURG.

Work is being pushed on the plant being built at Colonia by the Colonial Steel Company and the prospects are that the entire plant will be ready for operation by April 1. The puddling department, comprising ten furnaces, is complete, and will be put in operation this week. Three trains of rolls have been installed in the mill building and the other four are on the grounds. Four smelting furnaces with 24 pots each are about completed and will be in operation in a few weeks. The hammer shop will be in operation by April. The company contemplates building four additional smelting furnaces, of from 24 to 30 pots, and 10 additional puddling furnaces. The officers of the company are James W. Brown, president; George A. Howe, first vice president; T. H. Childs, second vice president and general manager; and C. M. Brown, secretary and treasurer.

Another coke plant is to be built in the North end of the Connellsville region. Greensburg capitalists have closed a deal for 90 acres of coking coal in Mt. Pleasant township, Westmoreland county. The tract adjoins that recently bought by the Mt. Pleasant Coke Company from Jacob Byers. The sale was made by R. C. Love, who, up until the deal was closed this week, had refused many offers for the coal. J. U. Kuhns and W. A. Wilson, of Greensburg, and J. A. Strickler, of Wilkinsburg, are the purchasers. They paid $1,000 an acre for the tract, or $90,000 in all. The new owners will organize a company and begin development as soon as possible. A plant of 60 ovens will be built and a mine will be opened up.

The Beaver Clay Manufacturing Company has been organized at Beaver Falls to manufacture enameled tile, enameled fire and building brick, and other products of clay. It is capitalized at $50,000 and the plant will be located in the Beaver valley, the exact site of which has not been determined. The company will apply for a charter March 17. The incorporators are James H. Cooper, Frederick N. Beegle, Louis Davidson, B. B. Todd, Harry Bonnell and Eugene S. Hoopes. The incorporators are residents of Beaver Falls, New Brighton, and Beaver.

The coke works on the Indiana branch of the Pennsylvania line known as the "Oklahoma works," were sold last week to Harry McCreery for $35,000. There are a number of ovens in operation and the land embraces about five hundred acres. Mr. McCreery owns 1,000 acres adjoining which will be transferred to a comany of which he will be the head. The works will be enlarged, new ovens built, and it will be made a complete coke plant.

The McKees Rocks Manufacturing & Foundry Company has been organized and will apply for a charter with a nominal capital of $20,000. The company has bought land at McKees Rocks upon which a building 333x100 feet will be erected to be used as a machine shop and foundry. The products will be mill and machinery castings and a recently patented combination hoisting jack up to 100 tons' capacity. The officers of the company are: President, John P. Pastre, at present assistant manager of the Anderson-DuPuy works of the Crucible Steel Company of America; vice-president, Dr. John A. Barr; secretary and treasurer, Charles W. Stoup; general manager, A. C. Uhl. The directors are: J. E. Digby, John T. Haskin, Christian Kircher, Peter Guenther and E. J. Schindehuette.

Hyde Brothers & Company, of this city, have recently sold 1,000 horse power waste heat boilers to the American Car & Foundry Company, St. Louis, Mo., the fourth order received from this concern for the Hyde boiler. The Norwalk Iron & Steel Company, Norwalk, O., has contracted for 1,000 horse power direct fired Hyde boilers equipped with shaking grates, while an order for three boilers of the waste heat type has been received from the J. G. Brill Company, Philadelphia. The latter order is the second one received from the Philadelphia concern.

Work has begun on the building at Twenty-seventh street and Liberty avenue, this city, for the Pittsburg Construction & Engineering Company. It will be one story 271 x 100 feet, and will be equipped with machinery to repair everything electrical. The company will also keep in stock a complete line of electrical apparatus. When the building is finished the company will remove its present offices from 427 Diamond street and its works from 712 Chestnut street, Allegheny.

W. E. Nusser, of the Oakridge Coal Company, this city, has bought the interests of B. R. Hatch, of Cleveland, O., in the Grace Coal Company, with offices in the Bank for Savings building. A half interst in the company is held by E. F. Fisher who will continue as general manager. The company is operating mines in the Somerset county and Panhandle districts. Plans are in preparation to install machinery at the Somerset county mines.

J. E. Jones, vice president of the Waukeesha Sheet Steel Company, of Waukeesha, Wis., is in Pittsburg to place contracts for a large

amount of new machinery for that plant. The company was organized about a year ago, and the new plant started up last year with Pittsburg mill workers. Most of the skilled men went from the old Chartiers plant of the American Sheet Steel Company, of Carnegie. It is expected that the capacity of the new plant, with the additional machinery ordered, will be doubled. The contracts will reach $200,000 in value.

City Recorder John R. Murphy and Director of the Department of Public Works, Robert McAfee, of Allegheny have awarded contracts to the Erie City Iron Works for four boilers, bureau of electric lighting, at $13,744; Pittsburg Gauge & Supply Company, four engines for electric light plant, $29,625; same company, removing old boilers, $4,500; Westinghouse Electric & Manufacturing Company, electric supplies, 46,602. The contracts for four stokers were not awarded, the bids, it is said, being irregular.

The St. Clair Furnace Company has awarded the contract to the Brown Hoisting Machinery Company, of Cleveland, for a complete modern iron ore handling equipment for the new blast furnace plant at Clairton. The plant will consist of a car dumper, two bridges and 700 feet each of iron ore and coke bins and will be completed in time for the operation of the blast furnace next fall. The company will open a new mine, the St. Clair, on the Mesaba range this spring.

The Altoona Iron Company has granted the men employed in the puddling department a raise of wages from $4.50 to $4.75 a ton. Every department is running double turn with orders booked many months in advance. The company recently completed improvements at the plant costing $15,000.

The American Turret Lathe Manufacturing Company, of Warren, Pa., has placed an order with the U. Baird Machinery Company, of this city, for forty tools to be used in its new plant. The U. Baird Machinery Company will also supply the entire machine shop equipment for the United States Engine Company, of Parkersburg, W. Va.

W. H. Harris & Son, machinists, manufacturers of miners' tools, are occupying their new quarters on Belmont street and have installed a new 800 pound steam hammer. This with a 300 and 600 pound hammer, enables them to handle heavier work than formerly. An Ajax forging machine is one of the latest installations.

Bids are being received by S. Diescher & Sons for the buildings of the McKeesport Manufacturing Company, to be erected at Port Vue. The estimated cost is $500,000. The buildings contemplated include a mill, 250x300 feet; an assortment house, 50x500 feet; a stock house, 40x 150 feet. All the buildings will be constructed of brick and stone with corrugated iron roofing.

The Magnesia Covering Company, Conestoga building, reports active demand for its product with a continuance of the heavy consumption during the coming building season. The company has completed work on the blast furnaces and blooming mill department of the Dominion Iron & Steel Company's plant at Nova Scotia; the blast furnaces of the Colorado Fuel & Iron Company, at Pueblo; the plant of the Union Iron & Steel Company, at Donora; the new merchant mills at Duquesne; the Carrie furnaces; the tinplate department of the Sharon Steel Company, Sharon; and the Armstrong cork plant, this city. The company is also covering the steam surface at the Allegheny plant of the Pressed Steel Car Company. The office of the company will be removed April 1 from the ground floor of the Conestoga building to room 59.

The Pittsburg & Lake Erie Railroad will spend a large sum of money for machinery to be installed in the new car shops at McKees Rocks now under course of construction. A full line of wheel lathes, boring mills, tire setting appliances, hydraulic or pneumatic riveting machinery for the boiler shop, and the latest design of powerful steam hammers for the smithing department, and other types embracing small planers, shapers, and drills will be purchased. The company will also have a foundry where brake shoes, composite metal for bearings and other fixtures will be made. Two 50-ton electric traveling cranes will be purchased for the erecting shop.

An application for a charter will be made March 11 by the Hussey-Binns Shovel Company, of this city. The incorporators are: Edward B. Alsop, George V. Wilson, Ralph H. Binns, Edward H. Binns, and John U. Hussey. The officers of the compay are in the Chamber of Commerce building, this city.

The American Steel Company, a new company being organized in this city, will apply for charter March 5. The incorporators are Eugene S. Reilly, Michael B. Kelley and Phillip B. Reilly, all of this city. The offices of the company are in the Park building.

The Porter Foundry & Machine Company, Darrah street, Allegheny, has completed eight pairs 14 x 16 double cylinder vertical engines for operating grinders and polishers at the Weidenkamp Mirror Company, Springdale.

Messrs. Charles H., William F., and Harry Keller, 5315 Butler street, will build a brass bronze foundry in the very near future. Some of the equipment has been purchased.

The United Engineering & Foundry Company has awarded the American Bridge Company the contract for an addition to its Frank-Kneeland department. The addition will be built to the foundry and will be 75 x 100 feet, increasing the size of the foundry to 225 x 100 feet. The company is also installing a 15 ton electric traveling crane in the metal yard of the Lloyd-Booth department, at Youngstown, O.

Jones & Laughlins, limited, will open two mines on the Mesaba range this season to be known as the Grant and Lincoln operations. They will be located not far from Virginia, where several of the Carnegie mines are and within easy reach of the Great Northern, Duluth, Mesasba & Northern and Duluth & Iron Range railroads.

At the annual meeting of the Mansfield Coal & Coke Company, the old board of directors was re-elected as follows: J. T. Armstrong, president; John F. Scott, H. K. Porter, W. E. Lincoln. George A. Berry, William Stewart and W. H. Shinn, secretary. President Armstr is also treasurer of the company.

Architect V. Wyss Thalman of this city h plans prepared for a new stock house, fo stores high, to be built for the Crystal Spri Company, at Wampum, Pa. The building will of brick and iron construction and fireproof. T dimensions are 34x41 feet and the estimated c is $32,000.

The Pittsburg Machine & Tool Company, Allegheny, has just shipped a 50 inch lathe the Sandy Hill Brass & Iron Works, Sandy Hi N. Y.; and 21 special lathes to the Briti Westinghouse Electric Company.

The Homestead Valve Company will return Homestead, April 1, to secure larger quart which is impossible at the present location, Wood street, this city.

The Homestead & Mifflin street railway h given a contract for rails to the Lorain St Company, to cost about $20,000, the line being miles long.

NOTES OF THE INDUSTRIES.

The General Fireproofing Company, Youngstown, O., has ben organized with a capital stock of $500,000 for the manufacture of herring bone lath and all manner of expanded metal fireproof building materials. The buildings which will be erected will be of brick and steel construction, will be two stories high in the majority, and will be about 350 or 400 feet in length. There will be two main buildings. As yet no site for the plant has been secured. The business of the International Metal Lath Company, of Niles, has been purchased and the plant will be moved to Youngstown to be rebuilt, enlarged and operated in conjunction with the new plant. The officers of the company are president, Myron I. Arms; secretary W. H. Foster; treasurer and general manager, W. A. Kingsley.

The Louis Lipp Company will establish a new foundry at Fifth and Wayne streets. It will be a general jobbing foundry, operated by a corporation entirely distinct from the Louis Lipp Company, though the same interests will be largely in both. The company does its own foundry work in connection with the manufacture of bath tubs, but when the new plant is finished this work will be done in the new plant, and the old location will be turned over to heavy castings entirely. Another cupola will be added, and the capacity largely increased. The name of the company will probably be the American Foundry Company, and it will be ready for operation about April 1.

The Louisville & Nashville Railroad Co pany, which is to be a customer of the steel r mill of the Tennessee Coal, Iron & Railro Company, at Ensley, has placed an order abro for 30,000 tons of rails owing to delays in t commencement of operations that the Ensl plant. The railroad company will bring the ra to Pensacola in its own steamships and will re part of the profit in the hauling. The pri will stand at Pensacola about $33 per ton. As so as the Ensley mill is in operation the Souther and Louisville and Nashville will make lar purchases of its output, being stockholders the plant.

Metal movements from the South in Janua broke all records. Pig iron movements fro Alabama and Tennessee were 173,916 tons; Birm ingham district alone, 90,834 tons; Sheffield 30, 365 tons; Chattanooga 18,460 tons; Anniston 1 565 tons; Nashville 10,684 tons; Middlesboro 4 008 tons. Pipe shipments were 8,292 tons, which Birmingham furnished 4,816 tons; Anni ton 1,597; Chattanooga 1,877 tons. Export mov ments were 398 tons of pig iron and 213 tons pipe. Steel shipments from Ensley were 7, tons, the highest record yet made.

The Sharon Foundry Company, Sharon, Pa which was recently organized by W. W. Shillin Joseph Riddell and others will soon ask bids f the erection and equipping of its plant. T building will be about 125x450 feet, constructed

brick and steel and to contain the foundry and machine shop. None of the machinery has been purchased. The officers of the company are Joseph Riddell, president, and Thomas Kennedy, secretary and treasurer. A general line of blast furnace. steel plant and rolling mill machinery, ingot molds, iron and steel castings, etc., will be manufactured.

The Youngstown Steel Casting Company, Youngstown, O., has awarded the contract for the erection of its buildings to the Garry Iron & Steel Company, of Cleveland. The plant will be 200x60 feet with a lean-to of 100x35 feet. The S. R. Smythe Company, Pittsburg, has been given the work of building an open hearth furnace, gas producers and dry and annealing furnaces. The Northern Engineering Works, Detroit, will build one 20-ton and two 5-ton electric traveling cranes for installation in the main building. Contracts for engines, boilers, dynamos and the electrical work will be let within a week.

The Youngstown Iron Sheet & Tube Company has bought ore property and a tract undeveloped immediately South of the Fayal mine on the Mesaba range. The area of the tract is eighty acres. The Youngstown concern has also acquired leases to two of the Maitland properties, one situated a short distance South of the Fayal mine, near Eveleth. The leases to both properties were owned by former State Senator A. Maitland, of Negaunee, manager in the Lake Superior region for the Republic Iron & Steel Company.

The new furnaces at the tin mill at Niles, O., are successful. It is said they show a saving of 50 per cent in fuel, and heat the iron ore more uniformly without causing scale. These furnaces were designed by William Dixon and all the furnaces will be remodeled to conform to the new one. It is said that several hot mills will be added to the plant this summer. The six mills do not turn out enough black plate to supply the tinning house, and black plate is constantly being shipped in from other mills.

The Lackawanna Iron & Steel Company was compelled to bank the twin furnaces at West Lebanon, Pa., and another at Cornwall, Pa., last week because of the failure to get coke. For the same reason it may be necessary to close the three remaining furnaces at Cornwall, West Lebanon and North Cornwall. The North Lebanon Valley furnaces operated by other companies may be compelled to suspend also.

The Ohio Leather Company, Girard, O., has a number of improvements contemplated at its plant. Plans are under consideration for another building 50x64 feet to be used for an engine, boiler and repair rooms. An order for a large amount of new machinery has been placed.

M. N. and J. H. Barnes, Fairmont, W. Va., have sold the Barnes brick plant and 10 acres of brick clay to a company, which with the Hutchinson Brothers, of Fairmont, has formed a company to be known as the Hutchinson-Barnes Brick Company. The company has a stock of $25,000. The plant will have a capacity of 45,000 brick per day.

William Steel & Sons, Philadelphia, have the contract for the new works of the Roxford Knitting Company, which will include the construction of a six-story brick factory, 200x60 feet, and a one-story brick dye, engine and boiler house 30 x 170 feet. Both will be built on the slow-burning mill-construction plan.

Lewis Haven's Sons, Philadelphia, have plans for a plant for the Lackawanna Iron & Steel Company, at Buffalo. The specifications provide for Bessemer steel works, 81.6x77 feet; a blower house 84.8x44.9 feet; a power house, 68x250 feet and a four-story steel works, 667.6x101 feet.

The Tudor Boiler Manufacturing Company has installed in the Emery building Cincinnati one of the company's new pattern vertical water tube boilers. It has a capacity of 300 horse power, stands 32 feet high, is 80 inches in diameter, and cost, set up, about $4,000.

The capital stock of the Youngstown Steel Casting Company, Youngstown, O., has increased its capital stock from $50,000 to $100,000. This company was recently incorporated to manufacture steel castings.

William Steel & Sons, Philadelphia, are estimating on a new factory for William Scholes & Sons of that city. It will be five-stories with a slag roof and outside fire-escapes, and will measure 48.3 by 58 feet with a stack 85 feet.

The Madison Avenue Foundry Company, Cleveland, O., has been organized by Frederick Metcalf, M. W. Peters, M. W. Merriman, G. H. Kelly, G. C. Whitcomb, with a capital stock of $20,000.

The Birmingham Pipe & Casting Company has resumed operation after a shut down of several weeks, during which several improvements, including a new steel stock house, were installed.

No. 4 furnace of the Tennessee Coal, Iron & Railroad Company at Bessemer, which has been enlarged from 160 to 200-tons' capacity since it went idle in December, went into blast Sunday.

Plans have been prepared for a power house for the Philadelphia Electric Company at Twenty-sixth and Christian streets, Philadelphia. It will be brick six stories 199.1 by 116.1 feet.

The Buckeye Foundry Company, Buck street has bought ground at Queen City avenue and Buck street to enlarge the plant.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—Worse conditions in the transportation end of the markets have intensified the distress among producers and consumers. The not too full supply of material and fuel was cut down dangerously resulting in the contraction of operations everywhere in all lines of production. The severe weather was the chief cause in disabling the best arrangements the railroads have been able to make. Bad winter weather is always a disturbing agency but this time seems to have had a more serious effect than usual.

The difficulty stretched all the way from the operation of the coke ovens in the Connellsville region and the movements of fuel, to the blast furnaces and on through the various departments of finished steel production. The valleys report the banking of 12 furnaces for want of coke which will make a hole in the estimated production of all sorts of pig iron from that section. The finishing plants are suffering worse than ever from the shortage in immediate billets but the softening in the weather will serve to strengthen the supply of all classes of material. With the slackening of the supply of raw products the railroads were enabled to make some headway against the stored steel at the finishing mills.

In general the market represents few new features. The shortage in the coke supply of the past two weeks has hardened the prices on all pig irons with the inquiries extending to September deliveries. With the supply, limited as it is, so seriously cut down there were no sales of Bessemer pig and the former nominal quotations prevail, though all sorts of premiums are offered for iron in any quantity, even the smallest. Grey forge holds its own readily, sales of 4,000 tons having been made during the week at $16.50, Pittsburg delivery, the rate of the past several weeks.

Billets command premiums even greater than formerly and the minimum rate has advanced $2 per ton this week, or from a base of a nominal $28.50 to $30.50 this week with none to be had.

In the finished lines the same congestion recently reported continues with the producers well in arrears. The shortage is especially severe in structural material and rails while there has been some stiffening in pipes and tubes, sheets and tin plates, while bars have had a better period than for some time. Producers continue to hold orders in check and are declining offers, at the same time refusing premiums and holding prevailing values. For soft steel bars the official quotation is $1.50, half extra for Bessemer stock, with an advance of $2 per ton on basic for large lots.

The following additional extras are charged: for one size aggregating 500 pounds or less, 25 cents per hundred pounds; for one size aggregating over 500 pounds up to 999 pounds inclusive, 15 cents per 100 pounds: for one size aggregating 1,000 pounds up to 1,999 pounds inclusive, 5 cents per hundred pounds. The charges went into effect two weeks ago.

CURRENT QUOTATIONS:

Basic	$16 75		Splice bars	1 50	
Bessemer		17 00	Angles	1 60	
Charcoal, hot	23 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	16 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 69	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Grey Forge, Shn	15 60		No. 1 wrought	15 50	
Bessemer billets	30 50		No. 1 cast	13 00	13 25
Open hearth	32 00		Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 60	
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

PHILADELPHIA—The supply in the local pig iron market is exceedingly short for the first half of the year. The pressure is strong, not only for more iron for shipment during the spring months, but also for more rapid delivery on contracts. There can be no doubt that the shortage of iron is genuine, and with such an enormous consumption it will require time to get back to normal conditions. Prices under the circumstances are, of course, very much varied; but the probable range at this time for the standard brands of Northern iron at Philadelphia and near-by delivery would be from 25 to 75 cents per ton higher than a week ago.

There is not much business doing in steel billets, more for the reason that none of the mills have any to spare, and where sales are made they are for small lots only and at very big prices. Domestic billets are quoted at about $32 and foreign billets at $28.50 to $29.

There continues to be a steady demand for all grades of manufactured iron and steel, the market showing up strong upon all sides. This is especially true of the steel structural trade. The mills are congested with tonnage, and several dollars per ton beyond official quotations are paid to secure anything like prompt deliveries. Plates and sheets are also quite active, but prices of the last named are slightly irregular. A good deal of business is being placed in bars, and some of the mills are well sold up for some time to come. There is a sentiment among the bar mills that prices ought to be higher, and it

is possible that they will advance before very long.

The Louisville & Nashville Railroad, is said to have placed an order for 25,000 or 30,000 tons of steel rails with foreign mills. The price of the rails was about $25 at Pensacola, to which the duty must be added, $7.84, making the rails cost about $32.84. Standard sections continue to be quoted at $28, but none of the doméstic mills can promise deliveries on new orders before September or later.

CURRENT QUOTATIONS:

Foundry, 1	$18 25	18 50	Girder rails	32 00	32 50
Foundry, 2	17 0	18 00	Angles, 3" & lr'gr		1 80
Gray Forge	16 75	18 00	Under 3-inch		1 90
Bessemer billets		32 00	T's 3" and larger		1 85
Open h'rth bil'ts	34 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

NEW YORK—Rogers, Brown & Company special:

A review of the iron markets is simply a repetition of features commented upon for weeks past until they are familiar to all. The only variation for the present week is added emphasis.

The demand for every class of material, instead of slackening, becomes more urgent. Necessarily the business that is done relates mainly to the last six months of the year. Necessarily also prices slowly harden. In pig iron, the market will perhaps average fifty cents above what it was a week ago, although there has been no change in schedule prices by the largest producers. It is agreed on every hand that iron and steel products are as high as they ought to go, and no one deprecates further advances more than manufacturers. So far there has been no desire by makers of pig iron or finished forms to encourage the rapid buying. The pressure comes from consumers. It is a question whether the latter have not reached a point of injudicious buying through over-anixety as to securing future supplies. Two years ago a buyers' panic precipitated an unhealthy rise, the results of which were injurious to all concerned. Prudence dictates avoidance of a similar experience while the memory of that event is so fresh in the minds of all.

English markets, which have been in the depths of depression for nearly a year, have caught the spirit of improvement either from the Kaffir boom or from the activity on this side. Prices of pig are up a couple of shillings, and the markets in a small way are excited.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$17 50	18 00	Angles	2 00	2 50
No. 2X fdy Jersey City	16 65	17 15	Tees	2 00	2 50
No. 2 plain Jer. C.	16 15	16 65	Zees	2 00	2 50
Sohn. 1 fdy N. Y.	16 75		Time deliveries, basis $1.75 for angles, beams and channels,		
No. 2 fdy N. Y.	15 00		Com. base, bars per 100 lbs	1 65	1 70
No. 3 fdy N. Y.	15 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	16 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

CINCINNATI—The local market is as active as the supply of pig iron will admit, with little if any change since last week. Orders were taken for delivery from March to October, and for every variety of iron. The melting of iron in the foundries and mills is at an unusual rate, and many consumers are compelled to shut down for days at a time, because the raw material is not delivered to them.

There is a greater shortage in coke and iron at the present time than ever before. The railroad companies are still unable to handle the trade offered and while it has been stated that there is an improvement in this direction, an investigation shows the contrary. The Southern roads are not allowing their cars to go North of the Ohio river.

The tonnage in finished iron and steel products is remarkably heavy. The demand for structural material is enormous with plenty of new business in sight. There never was a time when so many new plants and large buildings were being erected or in contemplation in this locality.

Plate mills are also doing well with excellent prospects for the greater part of the year.

The makers of sheets continue to report a good volume of business, contracts being placed for delivery many months ahead.

Most of the bar mills are full of work but in some localities they are not so busy as in others.

Scrap is in excellent demand, and the offerings are not sufficient to satisfy wants. The tone of the market is strong though quotations are perhaps not any higher.

While some foundries have advanced 25 cents on a ton, this is not general. It is thought that by this time next week all foundries will have advanced their prices.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$15 50	Steel hoops	1 95	2 50
South fdy. 2	14 75	15 00	Sheet, 26	3 50	
South. fdy. 3	14 25	14 50	Sheets, 27	3 35	3 85
South. fdy. 4	13 75	14 00	Sheets, 28	3 45	3 95
Grey forge	13 75	14 00	Angles, 3 to 6 in	1 75	2 50
Mottled	13 75	14 00	Angles, 1¼ to 2½	1 75	2 50
Shn. 1, soft	15 25	15 50	Beams and Chanls 15 in and under	1 75	2 70
Shn 2, soft	14 75	15 00	I b'ms 18, 20 24 in	1 80	1 50
L. Superior, fdy. 1	17 25	17 50	Tees	1 75	1 85
L. Superior, 2	16 75	17 25			

L. Sup'r char'l c w	19 25	19 75	Z's	1 70	1 80
Hang'g r'k ccl, 1	20 50	21 50	1 wrought scrap	12 00	18 05
Sohn ccl c w	19 25	19 75	Steel mlting stock gross ton	11 50	
Jaksn cy. silv'y 1	16 75	17 52	No. 1 cast	11 00	
St'l brs base hlf ex	1 75	1 90	Old iron rails g t'n	15 00	
Iron bars	1 75	1 90	Old car wheels	14 50	
Flange plates	1 82	1 92	Cast borings	5 00	
Tank steel	1 72	1 82	Turnings	5 50	
Ordinary fire-box	1 92	1 97			
T rails	36 00				

CHICAGO—It might almost be said that all kinds of prices prevail for pig iron. Large producers of local iron are endeavoring to keep prices down but there is none for sale for early shipment, and needy consumers are bidding premiums. Two furnaces in this district are idle because of the coke shortage and this restriction of output falls entirely upon foundry and malleable grades, as the steel mills require the same tonnage of Bessemer as before. Many furnaces are out of the market for the first six months of the year and there is very little iron offered for delivery during that period. There continues steady buying for use during the last half of the year.

The demand for finished product shows little if any abatement. It exceeds supply in various branches and delays in shipments seem a foregone conclusion for some time to come. Implement people continue to buy cautiously for wants during the third quarter or last half of the year, but are doubtless waiting for a development of crop probabilities before making extensive purchases. However, there is enough buying of a miscellaneous character to make the market active in bars, sheets, plates and merchant steel.

Structural material also is in excellent demand, building prospects in the West growing steadily brighter. For quick shipment iron bars continue to sell for $1.75 but transactions for future shipments are reported at $1.65, the same price as steel bars.

Old material is in good demand and the tone of the market is strong.

CURRENT QUOTATIONS:

Bessemer	18 00	18 50	Sheets, 26 store	3 20	3 30
Fdry Nohn 1	16 50	18 00	No. 27	3 30	3 40
Northern 2	16 00	17 50	No. 28	3 40	3 50
Northern 3	15 50	17 00	Angles	1 75	
Southern 1	16 15	16 90	Beams	1 75	
Southern 2	15 65	16 40	Tees	1 80	
Southern 3	15 15	15 90	Zees	1 75	
Forge	14 50	15 40	Channels	1 75	
Charcoal	20 00	20 50	Steel melt'g scrap	14 00	15 00
Billets, Bessemer	30 65	32 00	No. 1 r. r. wrought	16 50	17 00
Bars, iron	1 75	1 80	No. 1 cast, net ton	12 50	13 00
Bars, steel	1 65	1 75	Iron rails	21 50	22 50
Rails, standard	28 00		Car wheels	16 50	17 50
Rails, light	31 00	34 00	Cast borings	6 00	6 50
Plates, boiler	1 90	2 00	Turnings	11 00	11 50
Tank	1 75	1 80			

BIRMINGHAM—Although the Southern iron masters have not announced a change in quota-tions since the market was placed on the basis $12 per ton for No. 2 foundry, as a matter o t the basis is at least 50 cents above that mark and, for spot iron, seventy-five cents. Rogers, Brown & Company make that announcement out of their Birmingham office this week and the facts bear them out. Local foundrymen at Birmingham who keep in very close touch with the tendency of the market, have been buying recently for fall delivery at a premium over the nominal price and seem to think they are doing well. They apprehend a basis of $13 for No. 2 in the no distant future and the possibility of a continuance throughout the remainder of the year of that figure. The Southern furnaces are sold ahead for at least six months and the operators are seemingly honest in the statement that they are inclined to retire from the market for orders for delivery prior to July 1. This situation is stronger than any condition the Southern metal field has found itself in a number of years.

A feature of the present period is activity in the development of coal lands. the Galloway Coal & Coke Company, the Bessemer Land & Improvement Company, and a number of others are opening new coal territory. The Tennessee Company will shortly begin the manufacture of steel rails, several delays in the reception of machinery having stopped the beginning of operations at the new plant in Ensley.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 00	12 50	Tank	1 80	
No. 2 fdy, Sohn	11 75	12 00	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 00	11 25	No. 1 wrought	14 00	
Grey forge, Sohn	10 50	10 75	No. 1 cast	12 00	
Billets	27 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	310	3 50
Fire box	2 00				

Wire and Nails.

Wire, plain, car lots, jobbers	$2 05
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 25
Cut nails, less than car lots, retailers	2 35

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10 c
Copper, light bottoms	8 c
Heavy Composition	9 to 10½ c
Brass Turnings	6½
Heavy Brass	7 to 7½ c
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	$3.00
No. 1 Pewter	16

Coal.

PITTSBURG—The expressed intention of the coal miners of this district to make a contest for a better wage rate so far as operating conditions are concerned, serves to maintain the keenness of the interest in the question of coal supply and costs for the approaching season. At this point in advance it seems doubtful that the miners will offer any serious contest after the docility with which they accepted the situation at Indianapolis. The question of miners' wages and the apparent contest with the transportation authorities on the lakes are the only unsettled points in the rail coal trade and neither appears to be formidable.

CLEVELAND—The break in the ore carrying rate situation may have the effect of bringing something similar in the attitude of the coal carriers and the outcome of the case is exciting all interests for the bearing it may have on the rates on other material. With the increase in the anticipated ore tonnage the prospect seems to favor the carriers but the coal companies do not expose any agitation although outsiders regard the indications as favoring a higher rate on coal.

CHICAGO—The disarrangement of traffic by reason of the Eastern snow storms of two weeks ago has not yet disappeared, and receipts of coal from West Virginia and Ohio have been so seriously delayed that great scarcity has resulted. Pittsburg coal has not suffered to quite the same extent. The Western coals have been slow in getting to market by virtue of a returned shortage of cars and in consequence prices are a little stronger. This is generally regarded as only temporary, however, unless severe weather again intervenes. The Northwest is taking a large amount of all-rail coal, lake supplies having been practically exhausted. Coke is considerably higher, the arrivals during the past ten days having decreased to such an extent that the supply is inadequate.

CINCINNATI—It is stated that there is not in the river over 10 days' supply of coal, and unless there should come a good river in that time the various companies will have to draw upon their yard and elevator supplies which are by no means large, or else rely entirely on the rail roads for coal. The Monongahela River Consolidated Coal & Coke Company is practically out of coal, due not only to the general conditions referred to above, but to the fact that the company has been having trouble with its pilots, which has made it impossible to bring out as many boats as would have been done under usual circumstances. An advance is not expected in the price of coal at retail unless it might be nut and slack. These grades are scarce, and the price has been going up right along until it is $1.75 per ton. The price of coal afloat remains 6½ to 7 cents per bushel.

Coke.

The continuance of the bad weather has kept down the production and shipments of coee again. The past two weeks have been among the worst in the experience of the Connellsville region and if the production is kept down much longer in the same ratio the estimated production for the year will be subject to revision. The railroads have been badly crippled in making shipments in every direction and the outlook is far from promising. The tonnage of coke stored at the oven plants has grown so large that further encroachment on the working space is impossible. This has served to throw idle much of the productive list of ovens which accounts for the failure in the outfit. The incapacity of the railroads to make headway against the severe weather explains the shortage in shipments.

A summary of the Connellsville region for the week shows 20,459 ovens in blast and 827 idle.

The following figures show the scope of operations.

Production for the week	224,721 tons.
" last week	223,214 tons.
Increase	1,507 tons.
Shipments—	
To Pittsburg and river points	3,620 cars.
To points West of Pittsburg	4,023 cars.
To points East of Everson	1,598 cars.
Total	9,241 cars.
Last week	9,600 cars.
Shipments in tons for week	205,612 tons.
" " " last week	213,600 tons.
Decrease	7,988 tons.
Masontown Field	
Shipments for week	456 cars.
" last week	482 cars.
Decrease	26 cars.
Shipments in tons	11,856 tons.
" last week	12,232 tons.
Decrease	376 tons.

Coke Prices.

Pittsburg—Furnace, $2.25@2.50. Foundry, $2.50@2.75.

St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50

Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.25@4.50 Oonega, $4.25.

The Hecla Charcoal & Iron Company, Ironton O., has begun wood chopping and is making preparations to put the furnace in blast as soon as possible.

The Metal Markets.

LONDON—Tin—£113 15s-£112 5s. Sales, 240 tons spot; 570 tons futures.

Copper—£55-£54 5s. Sales, 950 tons spot; 1,650 tons futures.

Lead—£11 12s 6d-£11 10s.

Spelter—£17 15s-£17 12s 6d.

NEW YORK—Tin—$25.00-$24.75.

Copper—Lake, 12$\frac{3}{4}$-12$\frac{5}{8}$; electrolytic, 12$\frac{5}{8}$-12$\frac{1}{2}$; casting, 12$\frac{1}{2}$-12$\frac{3}{8}$.

Lead—$4.10.

Spelter—$4.15-$4.05.

ST. LOUIS—Lead—$4.05-$4.00.

Spelter—$3.90-$3.87$\frac{1}{2}$.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including February 17, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUN
Transit	370,681	187,878
Tidewater	144.6[illegible]5	89,943
Southwest	28,738	132,078
Eureka	22,381	475,644
Buckeye. Macksburg oil	662	170,003
New York Transit	264,090	
Southern	354,354	....
Crescent	79,341	....
Total	1,264,902	1,005,546
Daily averages	79,084	63,241

LIMA.

Buckeye, Indiana Local Division	927,178	661,696
Daily average	57,948	41,856

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
February 12	$1.80	$1.15	$1.15	$0.83	$0.80	$0.80
February 13	1.30	1.15	1.15	0.83	0.80	0.80
February 14	1.80	1.15	1.15	0.83	0.80	0.80
February 15	1.80	1.15	1.15	0.83	0.80	0.80
February 17	1.80	1.15	1.15	0.83	0.80	0.80
February 18	1.30	1.15	1.15	0.83	0.80	0.80

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight, 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4.75.

In these days of organization of large manufacturing interests, the ownership of such property is becoming more and more thrown into the shape of stocks and bonds.

Pittsburg is becoming not only the center for the manufacture of iron and steel, but is growing in importance as a place for the sale of iron securities.

Robert C. Hall, member of the Pittsburg Stock Exchange, will be pleased to give any information possible at any time concerning these securities, or make transactions therein.

Telephone Long Distance 3613 Court, or write No. 345 Fourth Avenue, Pittsburg, Pa.

Notes of the South.

W. J. Kelly, of New Orleans, president of the Warrior River Coal Company, of Tidewater, Ala., has secured interests representing $11,900,000 which will assist him in the inauguration of his plan to transport coal from Tuskaloosa county to New Orleans via the Warrior river, the Mississippi Sound and the Lake Borgne canal. John Hays Hammond, of New York, will be engineer of the company. Interested with Mr. Kelly are M. J. Sanders, of the Leyland line of steamships, New Orleans; and M. and R. Farriner, agents of the Dempster line of steamships.

Negotiations are in process for the adjustment of the differences between C. E. Robinson on one side and G. H., and E. T. Schuler and others upon the other hand, the result of which will be to stay the application of Robinson for a receiver of the Alabama Steel & Wire Company, which operates the rod and rail mill at Ensley. The imprisonment of the Schulers for contempt of court has been deferred for ten days. Robinson contends that the Schulers have used their majority interest in the corporation to his injury as a minority stockholder and that they have destroyed books of record, etc.

The Galloway Coal Company has begun extensive developments at Scottville, in Bibb county, where it has large tracts of coal lands. The Bessemer Land & Improvement Company is also opening up in this neighborhood.

T. H. Moore and others have organized the Moore Coal Company, capital $10,000, headquarters Birmingham.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots......37c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ......35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ......33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ......35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots......35c. pr. lb.	1000 lb. to ton lots......29c. pr. lb.
100 lb. " ......30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots; lot of 100 pounds, $1.10 per lb.; special price on large lots.

The New Zealand government is about to test American, English, and Austrian locomotives, to determine the best pattern to adopt for its railways, and to ascertain the relative qualities of engines in the important matter of fuel consumption.

OBITUARY.

THOMAS J. BRAY.

Thomas J. Bray, one of the earliest tube makers of this vicinity, died at his home, 5137 Woodlawn avenue, February 15. Mr. Bray came to the United States from Glamorganshire, Wales, in 1852 and ten years later entered the employ of Lewis, Oliver & Phillips with whom he remained 20 years.

Mr. Bray built the original plant on the site now occupied by the Pennsylvania Tube works; designed the Pittsburg Tube Company, Riverside Iron works, and Ohio Tube Company plants, all of which are now connected with the National Tube Company. In 1898 he remodeled the Continental Tube works, of which he was superintendent at the time of his death. Mr. Bray was the patentee of numerous devices for making pipe, and outside of his engineering activity was interested in other sciences and contributed to scientific journals. Mr. Bray was an active member of the American Microscopical Association. He is survived by two sons—C. W. Bray, chief engineer of the American Tin Plate Company, and T. J. Bray, Jr., chief engineer of the United Foundry & Machine Company, and three daughters, Mrs. H. T. Wright and Anna and Frances Bray.

Personal.

Charles T. Schoen has returned from a tour of Europe. He will be in Pittsburg this week when something tangible is expected to develop in his project to manufacture steel car wheels. Mr. Schoen is also supposed to be extensively interested in the new Standard Steel Car Company, which is looking around for a site for its prospective plant. After Mr. Schoen has been in Pittsburg a day or two it is believed that definite action will be taken for the location of the car wheel and the steel car plants.

Oscar Hannsson and Carl Vogel, Jr., of Oribro, Sweden, are at the Hotel Duquesne. They are identified with the manufacturing interests of their country, and are here to purchase material. Mr. Hannsson said he was interested in the manufacture of agricultural machinery, but did not know yet what orders he would place in Pittsburg.

John Devlin, who resigned the superintendency of the Tennessee Company's furnaces, at Bessemer, has acquired an interest in the Trussville furnace and is superintendent of that plant.

The Toledo, O., plant of the National Tube Company will, it is said, be closed permanently within the next few days, on account of trade conditions.

President Schwab's Return.

On his return to New York, last Saturday, after a trip of two months in Europe, President Charles M. Schwab, of the United States Steel Corporation, made the following general statement of his observations while abroad:

"I said in a speech in Chicago that any combination of business enterprises organized for other purposes than the reduction of cost and the increase of output is placed upon a false basis, and I return from my visit to Europe feeling more than ever impressed with the truth of that proposition. I come back with my ideas broadened and my enthusiasm unbounded.

"We are more than ever ready to demonstrate that the greater the scope of the combination the greater the possibilities for economy, and consequently the greater the possibilities for the reduction of cost. With these objects in view we must have our plants equipped and manned to perfection, and no care or proper expense must be spared to keep those plants modern and at the highest point that ingenuity, skill and enterprise can reach.

"While there exists in Europe the greatest feeling of friendship and admiration for America and Americans, I found also a degree of curiosity and uncertainty as to what we are going to do next. But, as I told them, they have their own protection at home in their laws, and what we are after is trade in the great common field, such as China and the Orient generally. This we want and this we are going to get. In order that we may do so, however, we look to Congress to make provision for the protection of our shipping. We will look after the manufacturing.

"Speaking as the president of the United States Steel corporation, I wish to impress upon our people here the fact that throughout England and Europe there exists no feeling of enmity among the great men, and my visit abroad this year was notable in the change I found when I, who had been there so often as an individual, presented myself as the president of the United States Steel corporation, which, as the greatest of American consolidations, was the center of curiosity among inquiring men of all nations, who sought on every hand to learn more of our methods and our plans."

Mr. Schwab said he preferred not to anticipate the proceedings at the meeting of the United States Steel Corporation.

E. H. Focht, of Reading, Pa., will build the new storage plant and abattoir for the Reading Cold Storage Company. It is to be four stories high, and one of the most complete plants of its kind in the country.

Mazout-Petroleum Uses.

The Engineering and Mining Journal says the latest application of mazout-petroleum residuum is to firing Siemens-Martin furnaces, either by the method of allowing the oil to fall drop by drop, or by that of reducing it to a finely divided state, which latter is found to give the better results, the quantity of mazout employed being only 20, and sometimes even 18 per cent by weight of the steel produced, while the life of the ovens and number of charges are at least equal to those with the use of coal gas. The latest improvement consists in leading the naptha refuse directly into the furnace by the inner of two concentric pipes, the outer leading up air under great pressure, by means of which arrangement perfect combustion is insured, because the finely divided oil is brought into intimate contact with air previously heated. As compared with coal-firing the advantages by that with naptha refuse are thus summed up. (1) The maintenance and tending of an oil station cost less than those of a gas-producer plant; (2) the furnace temperature can be better and more easily regulated; (3) turning the oil gas on and off is the work of a moment; (4) the use of the furnace may be interrupted for a longer or shorter period without difficulty or loss of fuel; (5) a higher furnace temperature is attained than with coal gas, without condensation, and (6) the oil gas constitutes a fuel absolutely free from sulphur.

Notes of West Virginia.

T. B. Williams, of Clarksburg, part owner and manager of the Colfax Red Brick Company, at Colfax, W. Va., has disposed of his interests to J. V. Fulton and J. P. Conn, of Uniontown, Pa. Conn & Fulton closed a deal Saturday by which they become owners of the entire plant. They will put it into operation again.

George V. Farman, Howard Farman, Clifford R. Hawkins and others of Buffalo, N. Y., have organized the Glenville Natural Gas Company to operate at Glenville, with a capital of $100,000. The same men have organized the Weston Gas Company, with $100,000 and will establish a plant there, also.

J. V. Thompson, of Uniontown, Pa., has ended a deal for 13,500 acres of coal in Harrison county for $48,000. Mr. Thompson, with Alfred J. Cochran, of Dawson, Pa., also bought several thousand acres in the same county on Ten Mile creek, for $50,000.

The Roane & Curll Lumber Company, of Weston, has bought several thousand acres of timber in Nicholas county. J. C. Roane, of the company, is buying machinery for several mills and branch tram roads.

The recently organized Cheat River Lumber Company contemplates the building of a large mill in Elkins next summer. The company's headquarters are at Cumberland. Md.

Lawrence Markey has bought the old Montgomery, W. Va., foundry and will rehabilitate it. M. N., and J. H. Barnes and Clyde Hutchinson have organized a company at Fairmont to build a brick works.

A representative of the New York Suburban Land Company, is at Clarksburg, in conference with the board of trade, relative to the location there of glass factory to cost $270,000.

The B. & O. is surveying for much double-tracking in the vicinity of Clarksburg to enable it to handle coal over the Short line to better advantage.

Monday the Laughlin Nail Company started to build two additional mills.

Industrial Notes.

Superintendent D. S. Brockman states that the American Sheet Steel Company, at a recent meeting voted a large sum of money to enlarge his plant at Wellsville, O. Work is to begin at once. The additions and improvements will increase the capacity of the mill fully 50 per cent.

The Ohio rolling mills will be moved from Findlay, O., to Toledo, at an early date. President Brenner has been offered a free site and $20,000 to make the change, and has decided to accept the proposition.

William Steel & Sons, Philadelphia, are estimating on Insinger's machine shop to be built on Stenton avenue, at Wayne Junction, that city.

The factory of the Hampden Corundum Wheel Company, Springfield, Mass., was almost totally destroyed by fire a few days ago causing a loss of about $50,000 mostly covered by insurance.

An address by Joseph Choate, Ambassador to Great Britain, on the career and character of Abraham Lincoln—his early life—his early struggles with the world—his character as developed in the later years of his life and his administration, which placed his name so high on the world's roll of honor and fame, has been published by the Chicago, Milwaukee & St. Paul Railway and may be had by sending six (6) cents in postage to F. A. Miller, General Passenger Agent, Chicago, Ill.

Cochrane Heaters.

When a man is feeding cold water, and he has somewhere about his establishment exhaust steam going to waste, or exhaust steam going into a condensor, that could be utilized for heating his feed-water, he has the opportunity, through us, of discovering, gaining control of and owning a veritable gold mine—a something that will pay dividends from the very first day it is started up; and, generally, the total first cost, including all the expenses of installation, will be more than offset by the first year's savings.

Other valuable considerations are gained when you put in the COCHRANE HEATER, for these appliances will accomplish the seemingly wonderful, yet simple results to which we are referring. There is a saving of water—say one-seventh of the total supply required—a saving of steam—an increase in the efficiency of the steam generating capacity of the boilers—less labor cleaning boilers—fewer repairs and shut-downs, etc.

Write for catalogue 2-H.

Harrison Safety Boiler Works,

Manufacturers,

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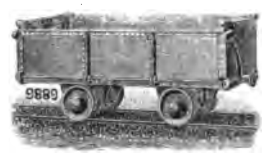
"HUNT".
(Trade mark)

INDUSTRIAL RAILWAYS.

A narrow gauge system of track and cars for handling and transporting heavy and bulky materials of all kinds in manufacturing establishments, power stations, etc.



Standard Charging Car for Boiler Rooms.

Cars built to suit every variety of service, and so designed that they run around a curve of 12 feet radius as easily as a wagon turns a corner.

C. W. HUNT CO.,

West New Brighton, N. Y.

Pittsburg Office, - - 515 Penn Av

Trade Mark.

"All is Not Gold that Glitters."

Our Mill, Mining, Railroad and Oil Well Supplies

HAVE THE TRUE RING.

You will find us right here with the "true ring" at a fair price, every time.

Yours truly,

FRICK & LINDSAY CO.,

200 Wood St., Pittsburg, Pa.

Ore Situation at Cleveland.

Late last week the break came in the controversy between the United States Steel Corporation and the lake vessel owners when one of the shippers contracted to carry 1,500,000 tons of ore between Duluth and Ohio ports for 80 cents. This will establish, in all probability, the list of rates that prevailed last season, eighty cents from Duluth, seventy cents from Marquette, and sixty cents from Escanaba. The amount covered was placed by Corrigan, McKinney & Company, of which John Corrigan's boats took a part, and five vessel firms of Cleveland took the remainder. Prior to this time some of the smaller shippers took tonnage covering 500,000 tons of ore, making a total, therefore, of 2,000,000 tons already covered. If precedent is to be any criterion this year the rate ought now to be established.

The steel corporation, however, has not been heard from, and will not be for a day or so yet. It is believed in some quarters that the present movement is a subterfuge to whip the vessel owners into line.

If such was the design it has succeeded admirably. Ten days ago all of the vessel owners were talking $1 from Duluth, and were demanding that the rate should be no less than 90 cents.

Both of these rates have been abandoned, and the vessel men fell into the eighty-cent rate with avidity, gobbling up the first block of ore that was offered.

Many of the shippers are holding back and making no charters. Some of them say they can afford to wait as long as the steel corporation can, and do not believe in making charters that will cost them more than the trust pays upon its ore. This will likely cause some delay in the making of season contracts. The statement of the waiting shippers has stirred up the antagonism of all of the vessel owners, who say that they will not take a ton of ore at seventy-five cents. One who is always a leader in the rate-making among the owners says that before they would take 75 cents the vessel men would combine and fight the rate, withholding their boats from the trade. With such determined opposition rising from the vessel owners, the stand which the steel coroporation will take, in view of the action of Corrigan, McKinney & Company, is being eagerly watched. This will not be known in all probability until the end of this week.

It is expected this year that the movement of ore will be about 22,000,000 tons. Of this amount the producers have tonnage to move about half. Two million tons have already been covered by contracts, leaving, therefore, wild on the lakes for which boat space is needed, 9,000,000 tons. Of this amount the steel corporation, and those who are waiting for it to act, control about 7,000,000 tons.

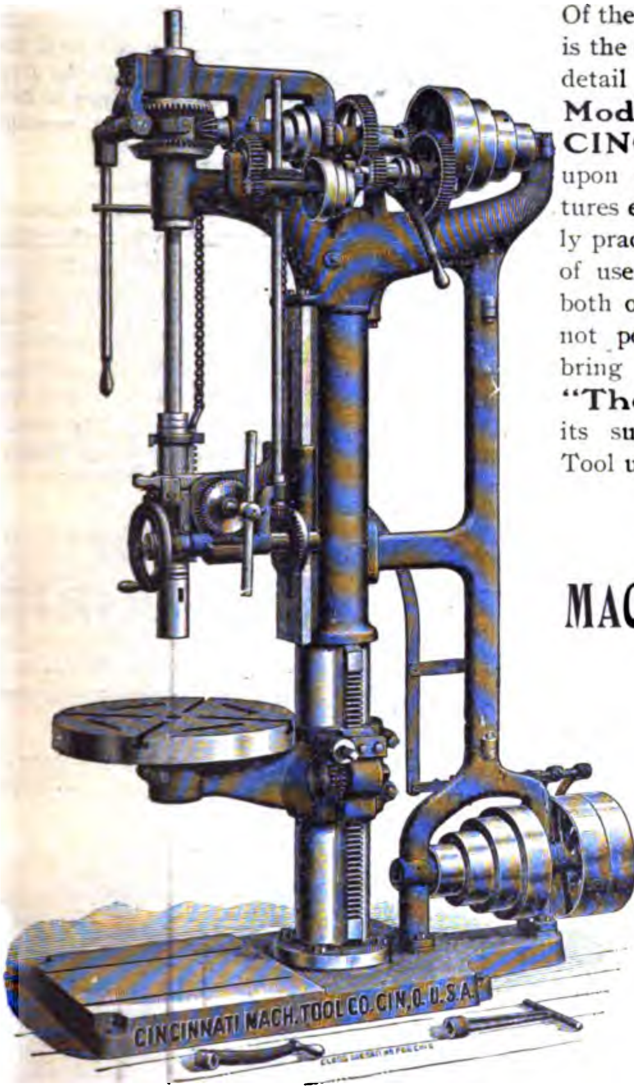
This is by long odds the major portion of the ore to be brought down wild this year. The situation becomes complex when the shippers, who are holding out for the lower rate, make the statement that those who control the greater portion of the ore ought to be allowed to fix the rate, instead of some of the smaller companies who are interested in an inferior way.

The Hill & Griffith Company, manufacturer of foundry supplies and equipments, Cincinnati, reports an active demand for its products with an encouraging outlook for a continuance during the balance of the year. The company is placing on the market a cupola with improved tuyers which has proven highly successful. An increased output at a lower cost is claimed. Among recent orders received for this cupola are mentioned the Hooven, Owens & Rentschler Company, Hamilton, O., two for Dallas, Texas, one for Warren, O., and one for Dayton, O.

The Cleveland Crane & Car Company, Cleveland, O., has decided to remove its factory from the present location at Wason street to Wickliffe, between the Lake Shore and the Nickel Plate railroads. The contracts for the new factory buildings have been let, and the company expects to have them completed and the machinery into them by the first of July.

The Vulcan Iron Works, Seattle, Wash., is preparing to erect a rolling mill with a capacity of 30 tons per day.

Drilling Machinery.



Of the type produced by this Company is the embodiment of perfection in every detail that goes toward making the **Modern Upright Drill. "THE CINCINNATI,"** it will be found, upon examination, possesses many features entirely original and yet thoroughly practical, as hundreds, yes, thousands, of users have voluntarily testified to, both orally and in writing. Space will not permit details, but a request will bring you full particulars regarding **"The Cincinnati,"** and proof of its superior worth to every Machine Tool user. Address, please,

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1935-1939 WESTERN AVENUE, CINCINNATI, O., U. S. A.

The only upright drill awarded a Gold Medal at Pan-American Exposition.

BROWN & ZORTMAN MACHINERY COMPANY,

Exclusive Selling Agents in Western Pennsylvania, Eastern Ohio, West Virginia for the following Manufacturers:

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Manufacturers of Lathes, Upright Drills, Milling Machines, Cutter and Reamer Grinders, Crank, Geared and Traveling Head Shapers, Radial and Multiple Drills, Punches, Shears, Rolls and Special Machinery.

Write for Catalogues.

Corner of Wood and Water Streets, PITTSBURG, PA.

Patents.

The following patents granted February 11,1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa., from whom printed copies may be procrued for 15 cents each:

Car dump for elevators in mines, John Moses, Youngstown, Ia; locomotive boiler, C. W. Newton, Baltimore; furnace for refining lead and zinc fume, F. L. Bartlett, Canon City, Colo.; rolling mill, Julian Kennedy, Pittsburg; liquid meter, W. G. Kent, London, England; metallic packing, J. C. Miller, Milwaukee; valve-gear link, Marion McClure, Felicity, O.; machinery for producing seamless metal tubes, F. J. McIntosh and William Thorburgh, Detroit, assignors to the Seamless Steel Tube Company, same place; rotary engine, G. P. Nielsen, Whitestone, N. Y.; manufacture of pig iron, J. A. Potter, Camden, N. J.; roasting, smelting and matting furnace, W. D. C. Spike and J. T. Jones, Tacoma, Wash.; piston, Samuel Trethewey, Pittsburg; crate for rolls, J. F. Budke, Canonsburg, Pa.: smoke preventing device, G. M. Conway, Milwaukee; drawing tubes, also heating furnace, Samuel Diescher, Pittsburg, assignor to Samuel Diescher & Sons, same place (2); steam pump, Feliz Freyhold, Washington, D. C.; process of treating refractory ores, E. B. Parnell, Carshalton, England; manufacture of tubular articles, J. P. Sneddon, Barberton, O., assignor to the Stirling Company, Jersey City, N. J. (9); mandrel for shaping tubular metal articles, F. D. Sweet, Pittsburg, assignor to the Stirling Company, Jersey City, N. J.; locomotive, Leonard Atwood, Philadelphia; automatic steam pressure regulator, D. P. Blount, Norfolk, Va.; furnace valve and dust catcher, G. G. Crawford, Braddock, Pa.; feedwater heater and purifier, Thomas Gunning, Pittsburg; cinder or spark arrester, S. L. Langdon, Magnolia, Miss.; removable boiler flue, G. W. Middleton, Corunna, Mich.; treating ores or similar materials, J. A. Potter, Cleveland; draft rigging, W. M. Piper, Allegheny (5); rotary engine, D. M. Dearing, Denver

Bradley Contracts Given.

A contract was awarded February 14 for the initial three buidlings of the Bradley Manufacturing Company. The concern has secured a tract of land 380 by 100 feet, on Pennsylvania avenue, between Grant street and Allegheny avenue. On this tract three buildings are to be built at once, and more later as may be needed by the company's business. The structures to be put up now comprise a main building fronting 380 feet on Pennsylvania avenue and 35 feet deep, a power plant and a pattern storage house, all to be of brick and stone. The contract for the construction of the building was given to C. H. Bradley, Jr., & Company, engineers. The cost of the buildings will be $25,000. When fully equipped with machinery the plant will have cost $175,000. The output of the new industry will be the Willans central valve engine.

The Bradley Manufacturing Company was lately organized with a capital of $200,000. The president is D. J. Geary, a manufacturer of boilers, at Oil City; vice president, C. H. Bradley, Jr., Pittsburg; secretary and treasurer, J. H. Bailey, Pittsburg. Among the directors is E. C. Lufkin, manager of the Snow Steam Pump Company, of Buffalo, and manager of the Holly Manufacturing Company, makers of pumping engines, at Lockport, N. Y.

FEED WATER HEATERS.

BY D. B. DIXON.

An engineer, from the position he holds is expected by his employer to look into and watch every point for economy, from the dumping of coal in the boiler room to estimating pro rata fuel consumption for products manufactured, be the fuel shavings, sawdust, or the more expensive kinds. Economy in steam boiler service, is only gained by the proper use of fuels. It can be shown by very simple rules what can be done in the way of utilizing the heat units in the fuel used to generate steam for power and heating purposes.

Fuel, in many localities, is the most important factor in the steam plants of today. Even in localities where water power is available, considerable coal is used for heating and other purposes; and when the supply of water is not favorable, resort must be had to fuel to generate power. In many steam power plants the first and only object sought is plenty of power and no thought whatever is given to fuel economy. Judging from the lavish consumption of fuel in some steam power plants one would suppose that the fuel was gotten for the asking. Every condition calls for its requirements. This is applicable to boilers and locations. For instance, if we were in a locality where the water was of the best, containing no solids, fuel cheap and space abundant, it would not be economy to study space and fuel, at the expense of life and cost. On the other hand there certainly would be economy in studying life and cost, or the expense of fuel and space where the latter was limited. It is so with boiler operation, the object and aim is economy. Take as examples many plants throughout the country and see what can be done in the way of economy in fuel or increasing the efficiency of the boiler capacity. The data necessary will be the type of engine, power, duty; water evaporated, temperature of feed water, fuel used, and cost of same. We must begin right in the matter and in a practical way.

Let us take as the unit of measurement a horse-power of 30 pounds of water evaporated from a temperature of 100 degrees Fah., at 70 pounds per square inch steam pressure by the gauge. This constitutes one horse-power—a power is measured by evaporation in power boilers, and not by condensation as in a heating boiler—two distinct kinds of work. A 100 horse power plant would be 3.000 pounds of water evaporated per hour from a temperature of 100 degrees at 70 pounds steam pressure. In steam at 70 pounds pressure there are 1,174 heat units in each pound of steam. The heat units are calculated above 32 degrees, Fah. This amount added to the total heat in one pound of steam gives 1,206 units; subtracting the 100 degrees temperature of feed water leaves 1,106 heat units that must be put into each 22 pounds of water which is converted into steam at 70 pounds boiler pressure. If we can increase the feed water temperature by some means that will not reduce the heat in the steam we can secure some gain by the operation. From the figures given above, we find that each pound of steam has received 1,106 units of heat from the fuel; 30 pounds of steam—the equivalent of a horse-power,—will have received 33,180 heat units. Taking the weight of water for 100 horse-power at 3,000 pounds and multiplying it by the increased temperature of the feed-water—110 degrees—would give us 330,000, which, divided by 33,180 shows us a gain of a little more than nine per cent by reason of increased heat in the feed-water supply. Other calculations with an increased temperature of feed water will show still greater gain. Let us see what will be the result in fuel economy. A gain of 9 per cent for every 110 degrees increase of temperature of feed-water—a saving in fuel of 110 divided by 9 equals 12 per cent. A plant of 300 horse-power, working under fair conditions, will burn, on an average, five tons of coal per day, which, at $3.00 per ton, would be $15.00—$4,500 per year, and 12 per cent of this is $540.00—quite a factor these days when fuel must be purchased. The feed-water heater is a subject that has been lost sight of in many steam power plants, where its value is not appreciated. Three are many and varied types of heaters all coming under the headings of "open" or "closed." The latter type is fast drifting out of use. It has served its time along with the cylinder and two-flued boiler. Heating

surface is very necessary in the make up of a heater: and heating efficiency for precipitation, heating space. filtering surface and accessibility for cleaning, are prime requisites. A closed heater has but one of these requisites, and what a disadvantage it has to be worked under—to clean it is impossible, if it does assist in precipitating the mineral matter from the water before it is thrown into the water—there to bake on tubes and shell with the high temperature to which the boiler is subject. Should the deposit remain in the heater, then the heating efficiency is destroyed. It takes a higher temperature to precipitate under higher pressure than at atmospheric pressure. This is well illustrated by the fact that upon mountains water boils at 200 degrees, Fah., and even less. If it were possible to get 2,000 feet below sea level, the temperature at which water would then boil would be much greater than 200 degrees. Another illustration of this fact is given by the vacuum system of heating, drying and evaporating such as is in use in salt works and sugar refineries; the pressure is removed and evaporation takes place at a lower temperature. The closed heater, it will be seen, lacks all of the very necessary requirements for boiler uses. The only use it is now put to is in condensing plants between the cylinder and the condenser, not so much for the value of the heat units it can abstract for boiler feed water as for the protection of the cylinder against the cooling effects from condensation. Attempts have been made to put settling chambers on the bottom of closed heaters, but the only chance anything would have to settle would be when the demand for water from the heater was stopped, and then only the amount of water in the heater—perhaps two barrels—would settle. Just as soon as the flow through the heater again commenced the water could not settle, but would pass into the boiler there to collect as scale—a very poor conductor of heat. The closed heater has another disadvantage in the fact that the heat from the exhaust is not applied directly, but is conducted through metals. This, together with the fact that there is no settling space or filtering surface, shows they are not up to the requirements in localities where much solid matter is in the feed-water. The open heater has many advantages, and when the requirements are considered they are certainly the most economical. The requirements of a good heater are: Heating efficiency and precipitation, settling space, filtering surface and accessibility for cleaning all parts. The heat should be applied as near the water supply as possible, so that every heat unit may be absorbed before condensation takes place; precipitation should occur early; there should be ample settling space and filtering capacity enough to take care of all the water necessary to supply the demand. The different parts should be easily accessible for cleaning without shutting down. Should the water used contain solids it is very necessary that they should settle before going through the filter. If settling space is lacking it becomes necessary to suck, or force the water through the filter. This should be avoided, for the sediment will stick, or adhere, to the outside of the filter. The feed-water heater, without any exception, is the most essential appliance in a steam power plant; for without it the boiler will be subject to severe strains by reason of expansion and contraction, and more fuel would be consumed to evaporate a given quantity of water. The more costly the fuel the more necessary the heater. When the advantages are considered. a heater is not an expense—it is a good investment. A thermometer attached to the heater will show. at all times, the temperature of the feed-water going into the boiler. It should always be kept in mind that the higher the temperature of the feed-water the less the amount of fuel necessary and the less liable will the boiler be to contraction—the most severe trial a boiler can have.

Should Reduce Shipments—Consul-General Hughes writes from Coburg: A word of warning to American shippers of agricultural machinery to Germany may not be out of place. Owing to last year's rather poor harvest and the prevalent industrial depression and to the fact that large stocks of our implements are still on hand and are being sold at lower rates than formerly, it would be well for American agricultural houses which have not their own headquarters in Germany to reduce their shipments to agents, on commission or otherwise.

THE PENSION SYSTEM AND PROFIT SHARING.

BY J. B. JOHNSTON.

A PENSIONING system for employes who have served corporate bodies long and faithfully, or who have been disabled through accident while in service, seems to be indicated as a part of the American industrial system in the not distant future. In many instances individual employers have established what approximates a pensioning system, but this has only been possible in cases where the nature of the industry was largely monopolistic through patent-rights, or where reputation had been attained to a degree that permitted fluctuations in price for substitutes to be ignored, as retarding or encouraging consumption.

While corporations and firms that employ large numbers have commonly "taken care of" those who have been injured or disabled in their service, usually by giving them some light occupation at reduced pay. and so with superannuated faithful workers, the pensioning system compulsorily enforced upon the employers of Germany, at the instance of Prince Otto von Bismarck, has given an unmistakable impetus to the idea in all industrial countries, and it is not infrequent that labor unions incorporate a demand for legislation looking to a pensioning system by the states for aged and disabled workmen, as well as for those dependant upon those who may be killed or injured while engaged in their occupations.

The departure from the old system of industry, when employers had a personal acquaintance with their small number of workmen, has made it impracticable to exercise that paternalism that was formerly in vogue. At the same time, the multiplication of machinery, by which more ponderous weights are handled and great power enlisted has magnified the dangers to life and limb in industrial occupations. It has been stated, on the authority of the Inter-State Commerce Commission, that the number of men annually killed in the service of railways exceeds the number killed in all the wars in which the United States have been engaged since the close of the war of the Rebellion, while the number of maimed and mutilated is attested by the one-armed and one-legged persons to be observed in every town and village through which a railroad passes throughout the country.

The daily publications chronicle the industrial accidents wherein men are killed or maimed, cutting down their earning power or leaving families without the means of adequate support, thus augmenting the number of those who must be assisted by the body politic and by private charity. This has been potent in the creation of a public sentiment favorable to legislation requiring corporate bodies that enjoy franchises to keep provision for such relief as the nature of the individual case seems to demand. In fact, a large number of such bodies have voluntarily made some provision for such to escape the censure of the press and public, and as a means of averting litigation that has cost large sums annually. This public sentiment is often actuated by the increasing amounts annually required by municipalities and counties to assist the destitute ones who have become wholly or in part a charge upon the community because of the death or disablement of the main supporter.

Perhaps no influence has been more dominant in the creation of this public sentiment in favor of pensions to the invalided or superannuated than the fact that the federal government has made such generous provision for the pensioning of veteran soldiers and sailors. This has been accentuated by the provision for the education of soldiers' orphans by some of the states, and the establishment of the Soldiers' Homes by both federal and state governments, where old veterans are surrounded with comforts until death. Pension systems for civil-service employes have been frequently proposed in Congress, and such proposals frequently are made in state and municipal legislatures for civil servants and for police and fire guardians. While the preponderance of sentiment seems to have been against the extension of the pension system to the civil-service employes, it has been so largely because of the higher taxation the necessity of increased revenue to pay them would involve.

A state system like that enforced in Germany, which has been advocated by some, is perhaps not probable in this country. Such a system is foreign to national ideas of individual self-reliance and independence. Moreover, complex constitutional changes would first have to be made before it would find the approval of the judiciary. There is an apparently strong public opinion favorable to legislation demanding that corporations that enjoy public franchises shall be required by law to make provision for disabled and superannuated employes, and for the dependants of those who may be killed while in their service. That it is recognized is attested by the fact that a large number of corporations will not accept the services of employes who are above forty-five years of age unless they relinquish all claims to consideration if they remain until reaching old age and decrepitude.

Profit-sharing has not been proved an unqualified success, for the reason that while employes are always willing to share in the profits, they uniformly make a wry face when asked to share in the losses during times of commerical and industrial depression, and protest vigorously when asked to accept a reduction in wage rates when business policy leaves only that expedient to managers. In numerous instances, too, where profit-sharing has been in effect for a series of years with apparent satisfaction to all concerned until disaster came, as was the case at Dolgeville, New York, some years ago, all suffered actutely by reversal of activity in demand for the product. The recent experience of the National Cash Register Company, at Dayton, O., is another case in point. For years this institution was selected as the model establishment of the country, but wage contentions led to a vast loss to employers and employes, and threatened to ruin the industrial standing of the community. In both instances cited the employers enjoyed a practical monopoly commercially, but their very success stimulated invention and manufacture of "just as good" or substitute productions, and intensified competition in the markets. The disaster which overtook Sir Titus Salt, at Saltaire, Engand, after a number of years during which ideal relations existed between employes and employers as a result of a profit-sharing arrangement, is another case in point. Profit-sharing has failed in so many instances where given trial under intelligent and foresighted management, that failure must be attributed to a break-down from its own weight.

While the corporate bodies will doubtless establish pension and relief systems for employes commonly, within the next few years, either by compulsion or voluntarily, for prudential reasons, it is difficult to estimate just how similar provision is to be made by those who employ only a few workers, and whose volume of business forbids their undertaking the burden in addition to daily wages. The effect must, naturally, operate to the advantage of the corporate bodies, for men actuated by self interest will seek to sell their skill and energy to those who hold out provision for the vicissitudes that all are liable to and which none may expect always to escape. The labor unions, it is true, commonly provide for the payment of a small weekly stipend in event of sickness or accident to their members, and for funeral benefits in case of death, but this does not contemplate the support of wife nor the education of children, and often leaves such in a state bordering on indigence in which they must be cared for in part, at least, by the community.

There are many systems in operation at present in this country, some of them having as their key-note the encouragemnt to thrift by employes, such as investing their savings in the securities of the employing company. Others make it obligatory for the employe to contribute to a fund from which relief and pension benefits are paid, in the management of which they a have a part; still others make membership in relief associations volitionary. Others, again, endeavor to stimulate employes to buy homes by making actual-cost prices, and permitting payments to be made as a rental until the purchase price has been paid, when deed in fee is given. Others encourage the same thing through building associations, the money being borrowed by the employing company at a fixed rate of interest. Another method is to encourage deposits in a savings fund until such time as enough is accumulated to buy bonds or mortgages.

Whatever the method, the idea is extending throughout all the forms of American industry, and there is little occasion to doubt its extension is contributing important-

y to the spirit, through education, of national thrift and a greater degree of conservatism of attitude towards employers and society that must work to a more solid state of industrial equilibrium, tend to magnify national power through accumulations of capital, add greater comforts in the homes of the people and uplift the standard of civilization in the mass.

What is to become of the unthrifty, the indifferent and intermittent workman, is a problem so complicated that the economist and the statesman must cope with it; for the time is near at hand, if it is not already here, when there will be no place in the ranks of American industrial life for such.

Petroleum Briquettes.

BRIQUETTES made with petroleum have been manufactured in various ways in different countries, notably in Russia, France, and the United States, as a combustible for steamships and for certain industries where rapid production of heat is desirable.

The advantages of such a substitute for coal are readily apparent—less storage room, complete combustion, etc. It is surprising that petroleum has not been utilized more generally in this form. The objections are that the briquettes injured the boilers after a short time, by reason of some chemical action produced by combustion; further, the blocks did not keep their form under the action of the heat, but fell through the fire box in a liquid state and the price is stated to be two-thirds more than that of coal.

A company has recently been formed at St. Etienne for the manufacture of petroleum briquettes, which claims to have obviated all the objections except that in regard to price. The advantags of the product are set forth as follows:

The briquette is composed of 97 per cent of petroleum and 3 per cent of hydro-carbon. The volume being equal. it weighs only half as much as coal and gives but from 2 per cent to 3 per centof residue; it produces no slag; it does not "run" when lighted and keeps its form like coal; it burns without odor and without smoke; it may be wetted with impunity, losing none of its properties; it consumes without explosion or sparks and yet with a bright and long flame; it may be kept indefinitely without deterioration. By this process, a degree of saponfication is obtained, by which the briquettes are rendered unchangeable even to the extent that if a projectile should enter a ship's bunker filled with this fuel, there would be no danger whatever of explosion; the effect being the same as in the case of ordinary coal.

The average heating power is from 12,000 to 14,000 calories, and the briquettes can be employed in any fire box or in any grate for domestic purposes.

The manufacture of these briquettes is very simple and requires but little machinery. If necessary, the petroleum contained therein can be recovered, with a loss of only 5 to 7 per cent.

The same company manufactures what are called mixed briquettes—half coal and half petroleum—but if these are cheaper than the former, they present less advantages from the fact that the density is greater and the heating power is only 9,000 calories. A steamer carrying 8,000 tons of coal would require 3,500 tons of mixed briquettes and only 2,500 of the pure petroleum briquettes.

The petroleum used by the company comes from the United States and only the refined quality is employed. When asked why the managers did not employ the Russian oil, the reply was that the price remaining the same (12 francs per 100 kilograms, or $2.31 per 220 pounds), the latter was less refined, as it contained more greasy matter.

A short time ago, the company submitted the briquettes to the government and after several experiments a trial for 150 tons was given, to be delivered as quickly as possible. This order is now being executed.

A group of capitalists at Marseilles is about to buy the invention of the St. Etienne company and form a company with a capital of 4,000,000 francs ($772,000), to establish manufactories at Marseilles, Suez, Batum, etc. The selling price of the briquettes will be about 8 francs per 100 kilograms ($1.54 per 220 pounds).

WEAK POINTS IN MACHINERY.

BY ALBERT STRITMATTER.

IF a chain is no stronger than its weakest link, no machine is stronger than its weakest part if that part is at all essential to the machine, for if any essential or desirable part gives out the machine is useless to that extent. The law of the "survival of the fittest" applies to machinery under the existing conditions of business methods to-day. When a man buys a machine he wants one that will give him continuously successful service at as small as possible expense for attendance, supplies and repairs. If he buys a machine which gives interrupted service, or which costs a great deal to be kept supplied with repairs, etc., he recognizes that he has an unprofitable apparatus and advises his friends not to buy that machine. If he is a wide-awake man he will remedy the defect, if it lies in the care given the machine or in some small part which can be permanently improved, or he will discontinue the use of the machine by selling it or disposing of it as scrap. The manufacturer of that machine loses the recommendation of that man as a source to which to refer prospective customers. Every manufacturer relies on the successful operation of his machines as an unlimited cheap and most effective supply of advertising. In such cases there is lost what might be called a positive recommendation, and there is an opportunity for a negative recommendation. The disappointed user will make no secret of the failure of the machine and his own loss and inconvenience. It furnishes material for competitors. Manufacturers know the effects of this kind of information in the hands of competing salesmen and especially in the hands of those who do not hesitate to exaggerate. Such conditions result frequently in law suits, or if the machine has not been paid for it is returned. Sometimes the machine is neither returned nor paid for, which increases the "bad debt" account.

Many times these conditions arise from a defect in the design of the machine, frequently where parts are operated by springs instead of positively. Springs are often unsatisfactory on account of breaking or the temper being drawn. Frequently, to produce cheaply, they are made too small to stand the strain put on them. This is the case with many crank shafts in steam and gas engines, as well as other machines. Babbitt metal is a material which many manufacturers economize by buying a cheap metal not of quality to stand the work. Defects in design can be remedied only by changing the mechanism. Usually this involves a radical change, but many times a slight variation will remedy the trouble. Poor material and workmanship are not to be tolerated by the manufacturer who wishes to be successful or to continue in business and as soon as these are seen to be causes of trouble the remedy of good material and skilled workmanship should be applied.

Many difficulties result from the careless and unintelligent attention given it by the user. Manufacturers frequently meet with this trouble and it seems almost beyond reason to hope that a time will ever come when such is not the case. As an illustration to this may be taken to a certain automatic grain scale, one of the most convenient and economical machines that a large grain elevator can have. It is arranged that the hopper is balanced by a sliding weight of the ordinary character, on an arm. As soon as the weight of the grain in the hopper overbalances the weight on the beam, it tips up and empties the grain from the hopper into a spout leading to the grain bin, car or other receptacle. At the same time the spout is automatically cut off until the weight on the beam overbalances the emptied hopper and returns it to the position for filling. As the weights of grains varies it was not found practicable by the inventor to graduate the beam in any unit, such as pounds or bushels. The instructions with the machine inform the purchaser that the weight on the beam can be set at any position. The hopper is then to be filled and as it is emptied the contents are to be weighed. Knowing the weight of one hopperful, the weight of any quantity of grain which passes through the scales can easily be determined on knowing the number of times the hopper empties. This is recorded by an automatic "counter." In spite of the simplicity of the machine and the plain instructions as to

the method of using it, about one in ten of the purchasers would make complaints to the manufacturers that they were unable to use it, as the beam was not graduated. Many of these scales went to intelligent grain elevator men but the fact remains that the manufacturers have met with a great deal of trouble of a kind mentioned.

In cases where trouble results from inattention or ignorance the manufacturer must enter into a campaign of education. This alone is the remedy. Remedies for some of the other evils have been mentioned. It is good practice for the manufacturer to keep track of as many of his machines as possible and endeavor to learn whether or not each one is giving satisfaction, and if not, to learn why. After learning the cause of the trouble he can tell whether he should attempt to educate the user into the correct use and care of the machine, or whether the difficulty is because of some defect in the machine and the remedy lies with him. Sometimes a machine will go out of a shop with some slight defect in it. This is, perhaps, unavoidable, but in every well organized shop the number of such occurrences is reduced to a minimum. However, when a manufacturer receives continual requests for some one repair part, it shows that that part is defective in some way and this should be remedied. One large concern keeps a record as nearly accurate as possible of all its machines, even when purchased by second parties as second-hand machines after years of use. After a man has had one of their machines for several months they send him a letter requesting full information regarding the operation of the machine; whether it is working according to promise or expectations; if not, a statement is requested as to the habits of the apparatus; facts as to wearing parts, etc.; whether it has required, or frequently or infrequently requires extra care or attention including repairs, etc. The manufacturer impressses the user with the statement that his interest in the machine did not cease when it left his plant and urges communication on any point of doubt.

A record is kept of the persons to whom this letter is sent, and the replies received. If such a letter is not answered it is because of the user's negligence if he continues to have difficulties, for the company has shown an eagerness to correct all troubles so far as it can and if the trouble lies not in the machine but in its installation or the care of it they endeavor to find this out and educate the user in the proper care of the machine. This policy has made for them innumerable friends who realize that no matter if their machines are paid for the manufacturer is still interested in the successful and satisfactory operation of them. Too many of them have had experiences with companies whose interest lapsed the moment the last payment was made and who failed to exert themselves even to the extent of answering letters asking for information on certain points.

British Columbia Minerals—An advance report made by the provincial mineralogist of British Columbia has just been issued, giving an approximate estimate of the mineral production of the province for the year 1901. The estimate is based upon the actual returns of most of the mines, and for those mines from which returns have not been received, it is based upon their approximate output for the past year. They re not given as the final statistics, which can not be made up till about April 1. In calculating the value of the products, the average price for the year in the New York metal market has been used as a basis. Roughly speaking, the increase over 1900 is 25 per cent on gross value of output of the province. There has been an increase in the production of all except placer gold and lead. The tonnage of ore mined from lode mines has increased a little more than 57 per cent. The gross value of the copper output has increased 206 per cent over 1900, the gain being largely in Vancouver Island mines, which have greatly developed the past year. The lode-gold output has increased 36 per cent and silver 14 per cent. The official figures for the lower metals are as follows:

Copper, 30 736,798 pounds, valued at $4,951,698; lead 50,522,960 pounds valued at $1,970,641; coal, 1,529,210 tons, (2,240 pounds) valued at $4.587,630; coke, 134,760 tons, valued at $673,800. Total $20,713,501.

Machine Shop Photography.

BY ALBERT M. POWELL, B. Sc.

In Cassier's for February.

THE photographic department of a modern machine manufacturing plant is considered at present almost as essential and important an adjunct to the successful operation of a concern as the draughting room or tool room. It should, therefore, be fully equipped with all the accessories of a first class photographic studio, and when the business is such as will warrant the outlay a professional operator should be put in charge. The great majority of manufacturing establishments, however, do not care to increase the scope of this department beyond a simple record of standard machines built at the present time, for the purpose of furnishing photographs to intending purchasers; consequently, an amateur, who may be one of the firm, a draughtsman, or even a workman in the shop, is selected to do the photographic work which may be required from time to time.

It is the writer's purpose here to outline a system of machine-shop photography which is the result of many years of experience in a small way, and is in every way suitable for even the most modest concern to adopt. As to the uses of shop photography—they comprise, to begin with, the supplying of photographs of the various products of the establishment, to serve advertising purposes. These photographs are usually made from a point of view that will most readily show the machine as a whole, substantially as it would look to an observer standing at its side or in front of it. This does not a lways give to an intending purchaser any idea of its construction or the arrangement of the working parts. However, it will in many cases be sufficient though occasionally a prospective purchaser desires to be further informed regarding other points which are only obscurely shown on this general picture, and in order to enlighten him it may be necessary to make such other views as will exploit them.

One must anticipate what is wanted, and should photograph the machine from different points of view. Photograph the working parts, often a single part, especially if this part is a feature unique in that particular design of machine—for instance, on a planing machine, the view looking down into the gearing. This will show how it is arranged and driven. Then there are the feeding devices, the cutting heads as a whole and in detail, oiling devices in tracks, belt shifting devices, and others, of all of which photographs would be desirable.

In the case of a lathe, photographs would be desirable of the cone head, taken in such a way as to explain its construction and special features: of the carriage and apron, with views showing its working parts; and of the special tool block, taper attachment, or any other device for which superiority may perhaps be claimed over a competitors's design and which it may be desired to impress upon a prospective purchaser. But there are many other things as well which may come to the mind of the intelligent and progressive shop photographer. all tending to increase the value of his department.

Anticipate what your customers may desire to be enlightened upon regarding your machine. and be prepared with a good photograph to answer his question. It does not follow that such photographs should be sent out broadcast in answer to every inquiry. In fact, it would not be good business policy to do so. as you might be giving your competitor the very assistance he was desiring to get so as to improve his design.

These detail photographs, as we call them should be in the hands of your traveling men and your selling agents. to be used by them solely for the purpose of selling your goods. Nothing can impress or influence a possible purchaser more than a well-selected lot of fine photographs, showing a machine completely in all its working parts.

Again, photography can be of great use in making copies of standard drawings. These copies may be bound in book-form, each book containing a complete set of working drawings of each machine. These drawings can be easily carried along by

traveling selling agents and with the detail photograph of the machine itself, most intelligently explain the machine to be sold. Photograhs thus made on 8-inch x10-inch plates and blue printed are of ample size to clearly show all lines and dimension figures, and are much easier to carry about than the large blue prints or tracings of the original drawings.

Again, where certain changes are made in existing types to meet the requiremets of special orders, such changes can be photographed and a copy filed with the complete order for future reference, should occasion reouire it, as in case of repairs, for example. This applies principally where some change is made or ordered in standard patterns and is made to fill only this particular order, the pattern being afterwards changed back to its original condition.

Photography can be used to advantage also in the pattern room, in making a record of patterns, especially in the case of a complicated pattern that it would be difficult to understand or to explain to the foundry men. In the case where patterns are sent to a distance to be cast, photographic records would just show how the separate pieces went together, especially if each piece in the photograph had a number marked on it corresponding to the number on the pattern piece itself. All patterns would be photographed on a small, inexpensive plate, and a print from each pattern could be made a part of the pattern records. If the card index be used for a pattern record, the photograph could be pasted or printed on the back of the record card, and this would show at a glance, even to a novice, the shape and character of the pattern itself, and would aid largely in picking out this particular pattern in the storage loft when occasion reduired it.

In the foundry, a photograph taken in the process of molding a complicated piece might be of great value for future reference should the same piece be ordered again, and might be the means of saving considerable money in making the piece a second time, especially if a new man had the making of it.

In the machine shop photography would apply equally in showing the work in its several stages, making a picture record of a complicated machine from the time the first machining was done to the final or completed machine ready for shipment. Of course, it would be desirable to do this only in cases where some special methods and appliances were used which would be of value and assistance should a similar problem arise in future work. A reference to what had been done in the past on similar work might be the means of saving much time and expense.

Southern Development.—"We have increased our coal production from 6,000,000 tons in 1880 to over 50,000,000 last year." says the "Maunfacturers' Record" of Baltimore in its Twentieth Anniversary Number, "but we have only opened a small mine here and there, when compared with the extent of territory and of wealth of coal in the great coal area of the South. Twenty years ago the South produced less than 200,000 barrels of oil a year. West Virginia alone is now producing over 15,000,000 barrels a year, and the extension of this oil field into Kentucky and Tennessee and into the far South is every day being emphasized by boring of new wells; while, turning to the Gulf, Texas has startled the world with an oil supply so far beyond our comprehension that it is almost folly to attempt to predict what may be its influence in revolutionizing many of the industries of Europe as well as of America. But the statistics which tell the story in cold figures of what has been accomplished, and tell how our pig iron production has grown from less than 400,000 tons to 2,600,000 tons, our cotton mill capital from $21,000,000 to $150,000,000, our total manufacturing capital from $250,000,000 to $1,100,000,000, our exports through Southern ports from $261,000,000 to $510,000,000, tell us really but a small part of the work which has been accomplished."

The Neva Bridge.—Consul-General Holloway sends from St. Petersburg, Russia, plans and specifications for the new palace bridge to be built over the Neva in that city. These are filed in the Bureau of Foreign Commerce, where they can be consulted by architects. Plans, bids, etc., must be submitted by September 1 (14), 1902.

UTILITY OF AUTOMOBILES.

RAILWAY automobiles are beginning to be considerably used in Europe: (1) As early and late postal trains; (2) on branch lines and others where passengers are few; (3) on trunk lines where it is often difficult to secure convenient secondary trains; (4) in industrial centers and city suburbs. Furthermore, the automobile railway train can be attached for a certain distance to an express and detached at the station where the road branches.

There is an economy in the personnel of the train, in the expense of traction, in material, capital, and maintenance, and an additional traffic because of the increased number of stations made possible by the facility of stopping and starting. Up to the present time, the carriages constructed are steam and electric.

Of the former type there may be mentioned the following: The Belgain State Railway has constructed carriages 46 feet long weighing 50 tons with a capacity of 53 passengers. They can go at the rate of 18½ miles an hour or at a maximum rate of 34 miles an hour. Two men are generally in control; sometimes three. There are also employed in Belgium two Rowan coaches for tramway service in the suburbs of Antwerp. They have 46 places, weigh when charged 4,000 pounds, and have a speed of 31 miles. The boiler is vertical, with inclined tubes. It is the same automobile used on the lines of the Paris Omnibus Company. The Russian State Railway (Nicolas line) employs two steam coaches. These are constructed with two stories, having 20 places for first-class, 20 for second-class, and 40 for third-class passengers. The management necessitates three men, and the maximum speed is 14 miles an hour. They burn naphtha, and the boilers have horizontal tubes. The Northern Railway of France has put on its lines a postal steam automobile, with room for 12 persons in the back part of the coach.

The following trials have recently been made in Europe with the electric automobile:

The Italian Mediterranean Railway has placed automobiles on the line from Milan to Monza. Each carriage has room for 90 passengers, of whom 16 can be seated. It goes at a rate of 27 miles, and is re-charged after each 50 miles. The French Northern Railway Company, at the same time when the steam automobile mentioned above was constructed, built an electric automobile weighing 20 tons, having room for 12 people, a speed of 30 miles and being capable of going 74 miles without re-charging. The Belgian State Railway has put in service five carriages for tram service without baggage. Each of these has 78 places, weighs 51 tons, and can make from 62 to 93 miles, with stoppages every three miles, at a speed of 19 miles an hour.

The French War Office made a number of trials of heavy vehicles for military purposes at Aldershot, the latter part of December. One of the lorries was fired with coke and propelled by a horizontal inclosed compound engine equipped with a water-tube boiler; one burned liquid fuel, but could quickly be altered to burn solid fuel: another, in which the machinery consisted of a compound engine on top of the boiler, with the power transmitted by chain gearings from the top of the boiler in front to the rear axle, burned coal and resembled an ordinary traction locomotive; and still another had a boiler with concentric water spaces, and connected framing, whence the power was transmitted to the rear axle by means of a specially constructed chain, capable of withstanding a strain of 30 tons. Each lorry had a four-wheeled trailer.

Several military officers left Berlin last month for Cannstadt, to bring back nine automobiles purchased for army purposes at a total cost of 108,000 marks ($25,704). The automobiles were driven from Cannstadt via Heilbron to the Berlin barracks, to test their speed and capacity for provision and ammunition transport.

Apart from coal mining and the big metallurgic industries, it is estimated that automobilism, directly or indirectly, maintains more people in France than any other industry. All the factories have tripled their output during the last three years, and manufacturers formerly making cycles now produce automobiles. At first, Paris was the only city where autos were made, but now Lyons, Bordeaux, Marseilles, Lille, St. Etienne, Nantes, and Rouen have factories to supply local demands. Leon

Auscher, in one of the Paris journals, mentions the following branches that are benefited by this industry:

Foundries for the production of cylinders and other castings; copper boiler works, factories for boilers, tubes, connections, etc; aluminum foundries, which work exclusively for the automobile industry; spring and spindle works, whose output has increased fivefold since 1898; factories for bolts, screws, rivets, and other small hardware; wheelwrights' shops, which depend in a certain measure on automobile factories; india-rubber factories which have developed to a colossal extent; nickel and copper shops; aluminum carriage building trade and allied industries; automobile painting trade; automobile upholstery trade, which employs morocco-dressed cowhide to such an extent that the French tanyards cannot meet the demand, and English and German products are also used; lamp trade, which furnishes two and sometimes five lights for each vehicle; the small industries allied to the carriage-building trade—the leather worker, the enameler, the cabinet maker—all contributing certain details before any single vehicle is complete; accumulator factories; specialties in measuring apparatus, ampere meters, volt meters, resistance-measurement apparatus, etc.; manufacturing, rectifying, and canning automobile mineral fuel and preparing cans of oil and non-liquid grease.

"By reckoning all these workmen," says Mr. Auscher, "a grand total is obtained of nearly 200,000 persons in France dependent upon automobilism."

Petroleum In Germany.

GERMANY'S annual consumption of petroleum is valued at $19.992,200, and represents nearly 7 per cent of the world's total output.

In 1900, Germany imported 978,678 tons of refined petroleum and naptha, of which 825.205 tons came from the United States and 128,330 tons from Russia.

The world's production of petroleum in 1889 was estimated in the statistical returns as follows:

United States 7,500,000 tons; Canada, 120,000 tons; Russia (Baku), 8,000.000 tons Galicia, 300,000 tons; Roumania, 100,000, tons; Germany, 20,000 tons: Java, Sumatra, and Burma, 300,000 tons; Total 16,340,000 tons.

American petroleum has a powerful advantage over its competitors. The following table will show the average results obtained after the different raw mineral oils have been refined:

Country	Benzine. Per cent.	Petroleum. Per cent.	Waste. Per cent.
Pennsylvania	10 to 20	55 to 75	10 to 20
Ohio	10 to 20	30 to 40	35 to 50
Russia	5	25 to 30	60 to 65
Galicia	5 to 30	35 to 40	30 to 55
Alsace	5	25	65 to 75

Ernest L. Harris, United States consular agent at Eibenstock comments in this way on the consumption of petroleum in Germany:

Russian petroleum has only about 34 per cent of the value of the American product. Any country which has been in the habit of using American petroleum can not suddenly substitute the Russian for it, for the reason that new apparatus is necessary for the latter.

The general impression in Germany is that petroleum prices are too high. Consumers claim that the discovery of new wells, such as those in Texas, together with the gradual cheapening of the cost of production, aided by rapid transit through pipe lines and tank steamers, has not caused a proportionate decrease in the price. Unquestionably, the high price of petroleum in Germany has greatly assisted the sale and use of gas, acetyl, electricity, wood alcohol, etc. The fact that the German consumption of petroleum has not increased since 1895 proves only too significantly the progress made by the last named substitutes.

BRIDGES IN PHILIPPINES.

IF American bridge builders take advantage of the opportunity offered in the Philippines for the erection of bridges during the next few years, they will make considerable money. There is a demand for new bridges and this will increase. Many bridges have been burned by the insurgents to stop the advance of the Americans, and many more are falling to pieces as a result of the decay of ages and neglect.

The natives know nothing of repairing, and structures have fallen to pieces through want of attention. If a plank on a bridge becomes loosened, instead of replacing it or fastening it down, the natives close the bridge to traffic and compel passengers to ford the stream. There are some iron bridges there which, in the event of breakages, or parts getting out of order the natives allow to run on until the bridge is practically ruined instead of making repairs. Under these conditions, the bridges of the Philippines are in bad shape. The long service has made them unserviceable. Some structures bearing the year mark of the builders indicate that the bridges were put up more than 100 years ago. Spain was rich two or three generations ago, and as she was then making a great deal of money out of the Philippines she could well afford to send bridge builders there for the purpose of erecting bridges. The churches paid large revenues into the Spanish treasury to maintain the roads and bridges of the islands, and the natives had to work on the roads a stated number of days each year or pay a heavy road tax. The bridge work was done almost exclusively by Spanish mechanics.

There are four kinds of bridges in the Philippines—bamboo bridges, (the crudest) hard wood (the next best), stone and iron. The bamboo bridges are inferior and dangerous. They are well enough for the barefooted natives, capable of balancing themselves along the bamboo poles over high ravines, and swift flowing rivers, but Americans and others, who wear shoes, have difficulty in making a crossing on such structures. Bamboo bridges are intended only for foot passengers. Natives carry heavy burdens of merchandise on their heads. or between them, and such bridges are frequently strained to the breaking point. Pieces of bamboo are stretched across spans 50 feet wide without any support in the center. The bamboo poles are arranged parallel and a dozen of these form the only footing.

The wood bridges come next in order, and what are left of these after having escaped the torch, are fairly substantial in that the timbers are strong and free from weak spots. The timbers are secured from the hard wood trees of the forests, of which there is an abundance, and some are of the most valuable woods. The natives have no means of cutting the timbers into proper shapes, so they hack out the wood by hand. The planks, however, are sawed out by four men. Timbers and planking are cut from mahogany, rose wood and other rich woods for these purposes.

The iron bridges of the Philippines are of recent introduction. The Spanish began putting these in about ten years ago. There a great many streams and rivers in the Philippines. One military expedition crossed 17 rivers in one day's march, five of which were provided with effective means of crossing; the others had to be forded. Some of the bridges had been burned down, and in some cases no means had ever been provided. The iron bridges shipped from Spain are of fairly good pattern but not strong enough for such traffic as will prevail in the islands under American rule. Heretofore traffic has consisted of caribou sleds and bull carts, both light when compared with the heavy army wagons and other vehicles used by Americans. Heavily laden army wagons go through bridge after bridge while en route. The iron bridges, being mostly new, will be effective for some time, provided they are strengthened, but all new bridges should be heavier. The Spanish bridges are all too narrow, having space merely for one team to pass over at a time, and no foot path is provided. In fact, no provisions are made for foot passengers. In Manila, Iloilo and some of the larger towns narrow foot paths are provided.

Railway, mechanical, and civil engineers who have visited the islands within the past year all acknowledge that within the next three years there is bound to be a great demand for bridges. On the island of Panay, fully two-thirds of the bridges

are in ruins, due to the war or flood. In many cases bridges were loosened from their foundations and allowed to float away with the stream. On Negros, Cebu, Gimeras and other Southern islands the same condition exists. The presidents of the various districts have been advised by the military authorities to rebuild the bridges. Agents from Russia, Japan, and German firms have been there, showing these presidents models of bridges, but it is stated that American bridges will have the preference when the time for the wholesale installation arrives.

For generations it has been the custom for the people to remain at home, and there was little commercial intercourse between the residents of the various lands. There was no mail delivery system and very little travel. But prevailing conditions are different. The opening of mail routes has induced natives to write letters, and the mails are an important feature in bringing about a better understanding among the natives as to the intentions of the Americans. Wagon routes and mounted couriers are being established in every direction. Japan has introduced a large number of wagons and carts and the roads are fairly well lined with vehicles which call for the service of bridges. The railroads in contemplation will also need many bridges. A railroad is rushed with traffic as soon as opened. Everybody wants to ride or ship freight. The mining districts are in sore need of railroad extension.

There is plenty of rock there, but no means of cutting it. Tools for cutting wood and stone must be brought along by bridge builders. Nuts, bolts, screws, wrenches, drills, and everything pertaining to bridge building must be brought from the United States or else bought in Japan, a two weeks' journey from most points.

Labor was obtained by the Spanish officials at from 10 to 15 cents per day, the rate paid the best carpenters and masons. The native workmen are of sufficient intelligence to work under the guidance and superintendence of American engineers and foremen.

There is plenty of money awaiting investment in bridge building, among the rich planters, wood cutters, mining concerns, etc. They merely want to know what the benefits are, and stand ready to invest money in any project having the stamp of American approval. Some Tennessee soldiers built toll bridges on the island of Panay and are making a good revenue.

Saw Making Method—In the process of straightening, leveling, and tensioning saw-blades, especially band-saws, the apparatus and tools in common use comprise a steel-faced anvil, a leveling-block, a bench, supporting rollers for the blade, a stretcher roller, hammers, both dog-head and cross-face, back gage, and leveling straightedge. These are used by supporting the saw on the rollers and bench, leveling it on the block, testing it with the straight-edge to find the lumps, bends, ridges, and twists, hammering with the crossface hammer to remove these, testing it to find the "fast," "loose," and "stiff" spots or places, and hammering with the dog face or tensioning hammer to remove such spots or places. In the use of these hammers great care must be taken to hammer both sides of the saw alike to prevent driving the saw through or dishing it. The saw must be perfectly flat on both sides.

Amos O. Patenaude, of Korbel, Charles J. Anderson, of Eureka, and John A. Anderson, of Falk, California, have just patented a saw straightening and tensioning hammer, by means of which the saw blade may be treated equally on both sides at one operation, avoiding the necessity of turning the blade over on the anvil.

The invention consists of a tool comprising a handle from which projects a pair of space shanks arranged to embrace the saw blade, the shanks having at their free terminals co-acting heads, the upper provided with an impact lug to receive the blow of a hammer. The saw blade is raised about an inch from the anvil by means of blocks, and the tool slipped upon the blade which passes between the separate heads and shanks until the spot or place to be treated lies between the two heads. In this position, the lower head is under the blade and rests solidly on the anvil while the upper head lies above the blade. A blow with an ordinary hammer is then delivered on the upper head, and the blade being between the two, both sides of it are hammered alike by the single operation. The saw is thus stretched on both sides without dishing it or driving it through, and all its "fast" spots may be opened up and the tension evened, while the saw remains prefectly level.

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Audi Alteram Partem.

Now that the Britishers have recovered from some of the "American invasion" scare, chiefly because of the improvement in industrial conditions at home and in Germany, there is a much greater willingness to hear the other side. For a time the air was filled with the many features of American supremacy in all things technical and mechanical and there seemed to the irritated islanders to be nothing but the American side presentable for discussion. Partial recovery from the depression of the past year has had a good effect and the defects of the British systems are not so glaring.

In the current issue of Feilden's Magazine some of the British technical authorities make plain to any one willing to see, that, while the English practice has perhaps been less progressive and, therefore, less successful as to production than the American system, nevertheless the British engineering must not be charged with the lack of British progress. It is shown quite conclusively that the British engineering talents have not been hidden or covered with rust, and that the blame for the errors of British defeat in the industrial war must be placed where it belongs—upon the shoulders of the staid and ultra-conservative British manufacturers. The engineers defend their position by showing that improved appliances approximating in efficiency the best American machines are, and have been, in existence in Great Britain but that the manufacturers have failed to avail themselves of their use.

The key to the situation, as pointed out by the engineers, is that the character in general of the British mechanical appliances is almost precisely similar to the character of the British user of the machines—strong and heavy foundations, massive in parts and power, insuring firmness, steadiness, and above all, the prime consideration evidently, a long life. The length of life of a machine for standard use in England seems to be the strongest test of its desirability. Therefore, while the British manufacturer knows that newer and better machinery than that he is using is at his side, he declines to make a change because the machinery he is employing has unnumbered years of conservative usage ahead of it. The Britisher seems to have dropped behind in the race because he chose. The machinery he required was right at his hand but it involved the expenditure of much money and he could not be convinced that it would be economy to throw away the old and buy the new for the gain in output and lower relative cost of production.

The British engineers appear to have made out a case against the manufacturers and the re-awakening may be productive of good to both elements of the manufacturing interests of the United Kingdom.

The parallel to the average British manufacturer may be encountered at any time, anywhere in the United States. The world has been so lavish in the bestowal of its flattery that some Americans have about reached the conclusion that the universe is really too small for the fullest development of the American character. But the earnest inquirer or observer who will spend a month in and about the iron and steel plants of, say, Pittsburg, standing at the very pinnacle of industrial greatness, will have his patriotism and civic pride shocked by what he will be able to see. It is true that we have some of the largest and best manufacturing plants, but the inquirer will be surprised to learn that much of the excessive superiority springs more from the fear of some of the European nations than from conditions existing in fact. He will see a prodigal waste of fuels, uneconomical employment of out-of-date machinery and reckless expenditure of motive power, much of it wrongly employed the year round without protest from anyone. He will see the American manufacturer just as difficult to convince of the superiority of the new machine over the old as the Britisher at whom he smiles. Compared with much of what we have read recently of American progressiveness, the lack of uniform progressiveness as to new machinery and methods of treatment in processes will come as a saddening shock to the American of unlimited faith in his countrymen.

Feilden's Magazine says: In order to settle the dispute as to whether American locomotives seriously compete with British locomotives abroad it will suffice to glance at the record of their output and export recently published at request by Messrs. Burnham Williams & Company, of Philadelphia, the builders of the famous Baldwin locomotives. In 1896 they built 547 locomotives, exporting 289; in 1897 they built 501, and exported 205; in 1898 they built 755, and exported 348; in 1899 they built 901, and exported 375; and last year they built 1,217, of which they exported [illegible]. Comments are unnecessary.

Personal.

Murray A. Verner, who has been associated with H. Sellers McKee in traction affairs has gone to St. Petersburg to look after details connected with the proposition to assume control of the traction car lines of the Russian capital. The proposition of the Pittsburgers has been approved in many channels, but no final ratification of the contract has been made. Mr. Verner sailed yesterday from New York. He will go to St. Petersburg and will return to Pittsburg in about eight weeks. During his absence he hopes to close the St. Petersburg matter and take some steps toward beginning the transformation of the lines into modern electric carriers. The roads will be extended and fitted with modern American appliances.

John Brunner, the retiring superintendent of the bureau of engineering and construction of the Pittsburg Department of Public Works, February 20 was presented with a handsome case of silver tableware by the employes of the bureau. The presentation speech was made by A. J. Harnack, a lifelong friend of Mr. Brunner, who was followed by Dr. J. Guy McCandless, director of the department, who expressed the regret of the employes over Mr. Brunner's departure. Mr. Brunner has accepted a position as construction engineer for the Illinois Steel Company and left Pittsburg last Saturday.

A. L. M'Clurg has acccepted a position with E. F. Austin, agent for the Stilwell-Bierce & Smith-Vaile Company, of Dayton, O., manufacturers of pumps, air compressors and feed water heaters and purifiers, who are doing a large business in this territory. Mr. McClurg has had a number of years experience in selling steam specialties and feed water heaters and purifiers and in the purification of feed water for boilers, and will make a specialty of this department.

F. H. Rapley, of London, England, has been appointed general manager of the engineering department of the Pressed Steel Car Company, with headquarters at the company's Allegheny plant and will enter upon his duties at once. For some years Mr. Rapley was the resident engineer of the Transportation Development Company, of London, the representative in England of the Pressed Steel Car Company. The position to be filled by Mr. Rapley is a new one, specially created for him.

The newly elected board of directors of the Pittsburg Coal Company re-elected the old officers as follows: Chairman and president, Francis L. Robbins; vice-president and treasurer, J. D. Nicholson; secretary, F. J. LeMoyne; auditor. J. B. L. Hornberger; A. M. Neeper will continue as counsel and the Union Trust Company as transfer agent. No other business was transacted. H. C. Frick, who lately became identified with the company and was elected a director, was in attendance.

At the Hotel Duquesne last Saturday night 89 young men, graduates of the leading colleges of the world, who are taking special courses at the Westinghouse Electric & Manufacturing Company's plants, gave their first annual banquet and decided to form a permanent organization, to be known as the Westinghouse Students' Association. C. F. Scott acted as toastmaster.

George T. Oliver, president of the Oliver-Snyder Steel Company, accompanied by his family has gone on an extensive trip to the far West. The party will proceed direct from Pittsburg to New Orleans, where a day will be spent, and thence will proceed to California. In the latter state a month will be devoted to sight seeing.

John M. Hansen, president of the new Standard Steel Car Company has returned to Pittsburg from a visit to New York and Philadelphia in the interest of his concern's venture. In President Hansen's office, on Penn avenue, a force of engineers is at work designing the buildings to be erected.

Charles M. Schwab, president of the United States Steel Corporation, spent two days in Pittsburg last week. Mr. Schwab arrived Saturday morning and spent the day with his father, mother and sister, of Loretto, and close friends.

E. H. Martin has been appointed metallurgical engineer of the Carnegie Steel Company, vice A. Mouell engineer of tests who has been appointed assistant to the president of tne Carnegie Steel Company.

At Uniontown, Pa., Saturday night, officials of the H. C. Frick Coke Company presented John P. Brennen, retiring manager of the Eureka Fuel Company, with a loving cup.

Victor M. Delamater, secretary of the Sharon Steel Company, has tendered his resignation, and it will probably be accepted by the board of directors.

The Burns Fire Brick Company, Williamsport, Pa., intends building a dust plant near Lock Haven, in the spring. Bids are being received for three nine-foot clay grinding pans, etc., for this plant. It is the intention of the company to build a standard gauge railroad from Lock Haven to its mines in the Scootac district which will be eight miles in length. The Williamsport brick plant will also be enlarged. Another pan and a boiler and engine will be purchased.

IN AND ABOUT PITTSBURG.

The National Bridge Company was organized in this city this week, with the election of officers and directors. The fficers of the new company are: E. M. Scofield, president; W. N. Conger. vice president; C. F. Blackman, secretary. The meeting was held in the temporary offices of the company in the Fitzsimmons building in Fourth avenue. The company will move its general offices from New York to Pittsburg April 1, and will be located in the new Arrott building. In the meantime work on the new bridge plant, which is to be one of the largest in the country, is to be started as soon as the weather is sufficiently open to permit of ground work. The plant is to be located at Colonia.

A meeting was held in the office of the Pittsburg Coal Company last Friday at which the rail coal shipping interests were represented and it was decided to make no change in prices at the present time. Another meeting will be called in the early part of March at which the new prices will be announced for the coming year. At Friday's meeting the situation was discussed at length. The companies have been having some trouble in making prompt shipments, and the tie-up in freight traffic came in for liberal discussion. The prospects for the year were thoroughly gone over, and during the time intervening between the session and the next meeting, the officials will have opportunity to think over prices.

The completion of the negotiations for the formation of the combine of the tool manufacturers of the United States is said to be now assured, and that the transfer of securities is being effected by a New York banking syndicate. The combine includes the American Ax & Tool Company, of Pittsburg, Kelly Ax & Tool Company, Mann Edge Tool Company, Warren Ax & Tool Company and Homer Ax & Tool Company. The assurance of the combination of the plants has stiffened edge tool prices and leading hardware jobbers have been advised that after March 1 prices will advance from 5 to 10 per cent on standard list.

The G. L. Bollinger Company, contracting engineers, successors to the Liberty Construction Company, has bought a three acre site at Verona and will immediately build a large manufacturing establishment. The plot is on the Plum Creek branch, near the Verona tool works. The present works, located at 2817 to 2823 Liberty avenue, Pittsburg, will be removed to the new location. Everything in the line of structural iron will be made. A small rolling mill and foundry will be part of the plant.

Arrangements have been made by the Buffalo, Rochester & Pittsburg Railroad Company to open up a large bituminous coal territory in Indiana county. Parties close to the management of the company have secured a block of coal land aggregating 4,500 acres in Brush Valley with the understanding that a branch railroad will be at once constructed to open virgin coal territory lying behind the recent purchase. The amount paid for the land already secured is said to be $100,000.

The hoisting and portable engineers of Pittsburg have decided to make a demand for a wage advance, effective May 1. The wage proposition is for $4 a day and eight working hours. While there is no uniform agreement now, most of the men of this craft get wages ranging from a minimum of 33 1-3 cents an hour. For hoisting structural steel the engineers get 40 cents an hour, the same as the bridge and structural iron workers.

At a meeting of the board of directors of the National Fireproofing Company, February 21, H. S. Black and A. R. Peacock, were elected to fill vacancies on the board by the resignation of J. P. Robbins and C. G. Jones. The new directors represent the interests of the George A. Fuller Company, which has become closely identified with the National Fireproofing Company at its recent reorganization.

Pittsburg structural material producers have instructed selling agents not to book any more orders as all of the possible output for the year has been sold. The only steel that can be had in the Western territory is in small lots in the hands of jobbers. The mill quotations for Cleveland are $34 a ton, but dealers are asking from $45 to $60 a ton.

The contract to furnish the mills for the new plant of the McKeesport Manufactuing Company, McKeesport, has been awarded to the Wheeling Mold & Foundry Company, Wheeling, W. Va., who will furnish 10 hot and 10 cold 20 inch mill.

Samuel R. Baldwin, a director of the Pittsburg Stove & Range Company says that the New Castle works will not be removed to be consolidated with the other plants near Pittsburg.

There is a probability that the Beaver Falls and Salem, (O.) plants of the American Steel & Wire Company may be removed to New Castle and united with the Steel & Wire Company mill there.

The American Sheet Steel Company contemplates the expenditure of $200,000 in increasing the capacity of its Wellsville plant.

NOTES OF THE INDUSTRIES.

W. E. Leake, president of the Abernant Coal Company and former president and general manager of the Virginia & Alabama Coal Company, has organized the Davis Creek Coal & Coke Company, capital stock $275,000, of which $75,000 is preferred and $200,000 is common stock. The officers are W. E. Leake, president; Henry Parsons, of New York vice president; J. C. Maben, Jr., secretary and treasurer; J. C. Maben, of New York, assistant secretary and treasurer. Among the directors are C. A. Lowe, George Parsons, H. O. Seixas and A. H. Larkin, of New York. The company will open a 1,000 ton per day mine on a 600-acre tract of land in Tuskaloosa county near Bessemer, Ala., build coke ovens, etc. Machinery, has been contracted for.

The report that the United States have secured the British Government contract for steel bridges for Uganda, has caused surprise and indignation in England. Nearly all the South Staffordshire steel bridge builders tendered for portions of the work, which is worth altogether about £200,000. The British firms declared that their tenders were cut very fine, being based on the following low estimates for material: bridge plates, £7 5s.; bridge girders. £6 5s.

The plant of the J. C. McNeil Boiler Company, Akron, O., over which there has been litigation ever since it went into the hands of a receiver, during the panic of 1893, was sold February 20 to Harvey Musser, of Akron, for $37,000. He will organize a stock company, increase the capacity of the plant and operate it on a large scale.

The Youngstown Iron Sheet & Tube Company has under consideration another increase in its capital stock by a million or a million and a half dollars for the purpose of entering into the structural iron business. The company started with a capitalization of $800,000, but the amount has been increased until it is $4,000,000.

The report of the United States geological survey says that Cuban mineral resources, so far as developed, consist almost entirely of hematite ore, which has been mined for many years a few miles East of Santiago. Nearly all the ore, which contains about 52 per cent of iron is shipped to the United States. Asphaltum has been found in several places.

At a recent meeting of the Sharon Steel Hoop Company, of Sharon, Pa., it was decided to erect an open hearth furnace plant with billet and bar rolling mills having a capacity of about 300 tons per day. The plant will be designed and built under the supervision of E. L. McGary, consulting engineer of 223 Fifth avenue, Pittsburg.

Several changes in the official list of the Philadelphia Roll & Machine Company, Philadelphia have occured lately. Frank P. Howell has resigned the position of president and been succeeded by William Wharton, Jr., while the position of manager held by Ellis D. Kent is now held by Isaac Weil.

United States Fish Commissioner George M. Bevin, with Governor Albert B. White and Secretary of State Dawson, of West Virginia, have purchased 4,000 acres of coal land in Preston county, West Virginia, for $60,000 cash. They have also taken an option on 2,500 acres adjoining the tract.

Dr. Metcherlich, the German mineralogist, of Frankfort-on-the-Main, announces the discovery of deposits of brown coal at Selignstadt, near Frankfort. The strata cover an area between the Taunus and Spezart mountains, and it is estimated they will yield several billion tons of fuel.

The Youngstown Iron Sheet & Tube Company, will engage in the manufacture of structural steel and will increase its capital another $1,000,000 to make the necessary extensions to the plant. This will necessitate the erection of mills not including the present plants, adding plate, beam, angle and other mills.

The government of New South Wales is considering an offer for the establishment of iron and steel works on the Parametta river for the manufacture of steel rails from New South Wales ore. It is estimated that the government requirements will be 20,000 tons annually.

William Lockhart, and other Pittsburg investors have leased a large tract of land in Slippery Rock township near New Castle and will develop deposits of limestone, iron ore and clay. A railroad will be built either from New Castle or Butler. The company is capitalized at $2,000,000.

The Calorific Heater & Manufacturing Company, Allentown, Pa., has plans prepared for a new machine shop 50x140 feet; a foundry 40x100 feet, cleaning and testing building 30x 40 feet; engine and boiler house 20x35 feet and core ovens 20x30 feet.

Mark W. Marsden, Philadelphia, has bought two acres of ground at Manayunk, on which is located a factory 50x150 feet, which will be used for the manufacture of fire proofing. It is thought that further additions will be made.

C. E. Robinson has filed an amendment to his bill in chancery for a receiver for the Alabama Steel & Wire Company, alleging that the Schulers are indebted to the company in the sum of $100,000, that the cost of the erection of the plant was only $530,000, and that both George H. and E. T. Schuler have charged to the company things purchased for their own use. It is freely stated in Southern commercial circles that the United States Steel Corporation is indirectly interested in the movements made by Mr. Robinson.

The purchaser of the three thousand acres of coal lands near Bessemer, Ala., was the Alabama Steel & Wire Company. The company will not renew its contract with the Tennessee Coal, Iron & Railroad Company for raw material, hence the purchase of the land, which will be immediately developed. The purchaser contemplates the erection of a blast furnace.

Kendrick & Company, Philadelphia, have the contract to build the machine shop for Alfred Ensinger. The plant will be 50 x 120 feet, two stories high and built of brick. A brick boiler house 20 x 30 feet will also be built.

The Milton Manufacturing Company, Milton, Pa., will add two Belgian roll trains to its plant, one a 10-inch and the other a 14-inch, which with other improvements will add largely to the present capacity.

The boiler house at the Buffalo blast furnace of the Lackawanna Iron & Steel Company, at Buffalo, N. Y., will be 68x368 feet. The power house No. 1 will be 83 x 400 feet. Bids are being taken for the work.

The West Jersey Tube Works, Bridgeton, N. J., is now in control of the rolling mills of the Cumberland Iron & Nail Works of that place and will begin operations at once manufacturing skelp iron.

The Southern Car & Foundry Company has resumed work on its pressed steel car plant at Ensley. It is expected to have the plant in operation by June.

The Mason Heater company, of Bellaire, O., capital $100,000, was incorporated at Dover, Del., February 18, to manufacture and sell heaters.

The American Lime & Stone Company, Tyrone, Pa., intends to equip its various plants with an electric and air plant in the near future.

The Kutztown Foundry & Machine Company, Kutztown, Pa., has increased its capital stock from $50,000 to $100,000.

The Consumers' Brewing Company, Philadelphia, Pa., will soon install additional boiler capacity and an ice machine.

Fire destroyed the Lima Steel Casting Company's plant Lima, O., February 23. Loss, $50,000, insurance, $25,000.

WEST VIRGINIA NEWS.

Jesse Hoover, of Uniontown, Pa., and others have organized the Short Line Fuel Company, with $294,440 capital, all subscribed. The company will do a general coal and coking business in Marion and Harrison counties.

The Southern Tanning Company, which recently bought Burt's tannery at Mannington will erect buildings and install machinery to increase the plant's capacity. Several new buildings are contemplated.

Senator Stephen B. Elkins and others have bought 14,667 acres of coal land in Harrison and Lewis county, for $454,667 Governor A. White, who was one of the promoters of the deal cleared $100,000 by it.

The Hitchman Coal & Coke Company, Wheeling, will build tipples on the B. & O. near Benwood Junction. The company has a large contract to furnish the B. & O. with fuel.

The Fairmont & Clarksburg railroad has begun work on a power plant at Adamston to supply power for the road besides furnishing it for other purposes.

The Wheeling Novelty & Glass Letter Company, Otto Jaeger, general manager, is ready to receive bids on its proposed works. Ground has been secured.

H. M. Clayton, of Fairmont, acting for Pittsburg investors, has about concluded a deal for 5,500 acres of coal in Harrison county, for which $137,500 will be paid.

The Kanawha Red River Fire Brick Company will build a plant near Charleston, having a capacity of 2,000,000 brick a day.

Edward M. Reed, of Fairmont, representing J. M. Guffy, of Pittsburg, has paid $50,000 to land owners in Preston county for coal and timber properties.

J. M. Guffy and others of Pittsburg have bought the Austin Coal Company's works at Austin, W. Va. The price is said to have been $125,000.

The Acme Box Company, Wheeling, is preparing to build an addition and put in more machinery.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—The tendency toward higher prices and actually higher rates in the extremely limited number of transactions that may be classed as new business, is the natural feature of the market and there is every promise that this condition will rule for several months, with danger in plain view while it lasts. The slowness of the movement of fuel and material to and from the coke ovens, blast furnaces and finishing plants overcomes and nullifies the best efforts of the producers. For a short time the better movement of materials had a decidedly good effect upon the markets but the blizzard weather knocked it all endwise and today the conditions are probably at their worst. The run of fuel and material is fully as bad during the worst of the car troubles last fall. This severe shortening of supplies could have but one effect under whatever conditions the markets were moving but when the situation is as bad as could well be without forcing actual suspension in production the inevitable effect is at the maximum. The congestion could not be worse than at present and there is nothing in sight to outline any improvement.

Higher prices have forced themselves in through sheer weight and against all the determination of conservatism to prevent the rush toward the danger line. Raw materials are moving upward and their course cannot be stayed much longer although the advances are not heavy. The lowest prices on Bessemer are from $15.60 to $17.00, at valley furnace, at which rate 4,000 tons were sold during the week. These rates are virtually nominal and are mainly for the regular buyers. For new business the rates have reached as high as $17.25 at valley furnace or $18.00 at Pittsburg, and higher.

Mill iron maintains all the strength recently reported for that material and is included in the higher range of prices. During the week 1,000 tons were sold at $16.75 and $17.00, Pittsburg delivery, which is a clear jump of 50 cents per ton over the best previous price. Mill iron at $17.00 is an experience that comes but seldom even during such a period as this.

There is nothing new to be said of billets. There are none in the market at any price and no price but one that is purely nominal and official can be quoted. Buyers and sellers of the small lots that are discovered here and there have a price that fits each individual case.

Muck bar is quoted at $31.00 and $31.50 per ton, Pittsburg. Iron skelp is quoted at $1.85, steel at $1.75, no change from last week.

CURRENT QUOTATIONS:

Basic	$17 25		Splice bars	1 50	
Bessemer		17 75	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill iron	16 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 69	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Grey Forge, Shn	15 60		No. 1 wrought	15 50	
Bessemer billets	30 50		No. 1 cast	13 00	13 25
Open hearth	32 00		Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

PHILADELPHIA—There is a scarcity of pig iron in the local market, and from the present outlook there is little prospect of any immediate relief. It cannot be said that there has been any actual suspension of work because of the insufficiency of material for immediate use, but it has been so close to it that there has been considerable uneasiness, and for that reason there is a continued pressure to secure deliveries for a period covering the next sixty to nintey days. It is reported that negotiations are in progress for the importation of West Coast Bessemer iron, which is being offered at $19, but no actual sales have been closed as yet. Quotations for the standard brands of Northern iron vary very much, as everything depends on conditions with which the trade is perfectly familiar, the range being about as last week for Philadelphia and near by deliveries.

There is continued scarcity in steel billets, and for prompt delivery, which is very hard to obtain, prices may be quoted at $32 per ton for American and pretty near the same figure for German. There is no abatement in the demand for finished iron and steel, and prices are very firm. Mills are all busy, some of them uncomfortably so, being unable to make deliveries as required by the buyers. The demand for sheets is so heavy that a scarcity in that line seems to be the result. Structural material of all kinds is actively sought after, and producers have an enormous amount of work booked. Bars are in strong demand and the makers are fully employed. The call for plates is not unusually large, but orders are sufficiently numerous to keep all the mills fully employed, so that on the whole business in every branch is in a most satisfactory condition.

CURRENT QUOTATIONS:

Foundry, 1..........	$18 25	18 50	Girder rails..........	32 00	32 50
Foundry, 2..........	17 00	18 00	Angles, 3" & lr'gr		1 80
Gray Forge..........	16 75	18 00	Under 3-inch........		1 90
Bessemer billets...		32 00	T's 3" and larger...		1 85
Open h'rth bil'ts...	34 00		Under 3-inch........		1 90
Steel bars..............	1 70	1 80	Heavy plates.........		1 80
Refined iron bars..	1 90		Beams and chanls		1 85
Standard rails......	28 00				

NEW YORK—Rogers. Brown & Company—The events of the week have been enlivening. The one of most importance is the sharp revival in foreign markets. English pig iron has advanced $1.25 per ton in less than a month, and about 75 cents a ton within five days. German steel for import is up from $1.50. to $5.00 per ton, according to special circumstances of the transaction. As near as can be ascertained, something like 150,000 tons of German and English steel has been engaged for import in lots of 500 to 10,000 tons, and covering a wide range of material. Advancing prices tend to check further importations.

But little foundry pig iron has been bought on the other side, though there has been much figuring. The lowest quotations obtainable on Middlesboro No. 3, delivered ex-ship New York or Philadelphia, are 52 shillings 6 pence, say, $13.00, to which is to be added $4.00 duty. One cargo was booked for early delivery by a New York house.

Since the depression set in, English and continental consumers have withheld orders, as is customary in declining markets. When recovery starts, home demand of course springs up. So it is not surprising to learn that British and continental mills are again filling up order books. The American view for months has been that our foreign friends have overdiscounted the disturbing feature in the steel and iron trades, and the event seems to confirm this view.

It is worthy of note that English stocks of pig iron are almost at the lowest point for a generation, and that the world stocks are, relative to demand, the lowest ever known, and actually are lowest on record for twenty years. This being remembered, is coincident with plans for development and improvement that touch nearly every part of the globe.

There has been no slackening in demand for domestic iron. Dealings are almost wholly in the last half of the year, and at steadily enhancing prices.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City......	$17 50	18 00	Angles..................	2 00	2 50
No. 2X fdy Jersey City....................	16 65	17 15	Tees......................	2 00	2 50
No. 2 plain Jer. C.	16 15	16 65	Zees......................	2 00	2 50
Sohn. 1 fdy N. Y..	16 75		Time deliveries, basis $1.75 for angles, beams and channels,		
No. 2 fdy N. Y......	16 00		Com. base, bars per 100 lbs.........	1 65	1 70
No. 3 fdy N. Y.....	15 50		Refined base, bars	1 85	1 90
No. 1 soft............	16 75		Bands, base..........	2 40	2 50
No. 2 soft............	16 00		Norway bars.........	3 75	

St'l r'ls Estrn mill	28 00		Norway shapes....	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.....	2 30	2 40	Old T rails, iron f. o. b. cars.......	20 00	21
Sheets, blue annealed, 10..........	2 70	2 80	T rails steel f o b c	16 50	17
Mach. steel, base, at store, N. Y., per 100 lbs.........	1 90	2 00	No. 1 wro't scrap iron f o b cars....	17 50	18
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 5
Ship & tank plate, on dock............	2 50	2 50	Old wrought pipe and tubes.........	13 00	14
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10		Old car wheels, f. o. b. cars.........	16 00	17
Beams and chan'ls 15-in & under....	2 00	2 50	Old ham. car axl's f. o. b. cars.......	22 00	23
			Wrought turnings deliv. at mill......	11 50	12

CINCINNATI—A heavy inquiry for deliver[illegible] during the third and fourth quarters of the yea[illegible] was the principal feature of the pig iron marke[illegible] the past week. Buyers who failed to provide fo[illegible] their wants for the first half are compelled t[illegible] pay premiums, as but little iron is offered fo[illegible] quick shipment. Southern furnaces are prac[illegible]tically out of the market to July and sever[illegible] furnaces refuse to quote for delivery after th[illegible] period in anticipation of an advance in coke an[illegible] wages. A sale of 5,000 tons of grey forge fo[illegible] Eastern delivery is reported at $11.85 Birming[illegible]ham. Shipments from the South are in muc[illegible] better shape. It is estimated that twice as muc[illegible] iron was shipped the past month as was produ[illegible]ed.

Several foundries in this district were force[illegible] to shut down for a few days last week on accou[illegible] of a a shortage of pig iron and coke. Quotatio[illegible] presented are for shipment over the last half [illegible] the year. Several furnaces are asking an ad[illegible]vance of $1 a ton over the price held by the m[illegible]jority of producers.

The coke market is strong with immediate d[illegible]livery almost out of the question. Sales mad[illegible] for future delivery were heavy. Prices have ad[illegible]vanced.

The situation in finished lines shows but litt[illegible] change. Demand continues in large volum[illegible] while supply does not nearly equal it. Stru[illegible]tural material is in worse shape than other fi[illegible]ished lines, so far as supply is concerned. Seve[illegible]al instances are noted of a change in plans [illegible] buildings from steel superstructure to woo[illegible] The market for iron and steel bars continu[illegible] strong though fairly quick deliveries are offere[illegible] There has been some softening in price of ir[illegible] and steel from store, though the cut is not ge[illegible]eral.

CURRENT QUOTATIONS:

South. fdy. 1.........	15 25	$16 25	T rails................	36 00	
South fdy. 2.........	14 75	15 75	Sheet, 26..............	3 40	
South. fdy. 3.........	14 25	15 25	Sheets, 27............	3 60	
South. fdy. 4.........	13 75	14 75	Sheets, 28............	3 60	
Grey forge...........	13 75	14 50	Angles, 3 to 6 in...	1 70	2 [illegible]
Mottled...............	13 50	14 50	Angles, 1¼ to 2½..	1 75	2 [illegible]
Shn. 1, soft..........	15 25	15 25	Beams and Chanls 15 in and under..	1 75	2 [illegible]
Shn 2, soft..........	14 75	15 75	I b'ms 18, 20 24 in..	1 80	[illegible]
L. Superior, fdy. 1	18 10	18 85	Tees....................	1 75	[illegible]
L. Superior, 2......	17 60	17 85	Z's......................	1 70	[illegible]
L. Sup'r char'l c w	21 00	22 00	1 wrought scrap...	12 00	13 [illegible]
Haug'g r'k ccl, 1 ..	21 50	22 50	Steel milting stock		
Sohn ccl c w........	19 25	19 75			

Jaken cy. silv'y 1...	18 10	18 85	gross ton............	11 50
St'l brs base hlf ex	1 72	1 82	No. 1 cast..............	11 00
Iron bars..............	1 70	1 80	Old iron rails g t'n	15 00
Flange plates........	1 82	1 92	Old car wheels....	14 50
Tank steel............	1 72	1 82	Cast borings.........	5 00
Ordinary fire-box.	1 92	1 97	Turnings.............	5 50

CHICAGO—February will live in the memories of the Western pig iron trade as an exceedingly active month. Buying has increased in volume as the month progresses and the past week has witnessed heavy and numerous transactions. These are mainly for deliveries during the second half of the year. Nearly all the large Western users of pig iron have purchased at least a portion of their expected needs up to the close of the month. Prices have shown the effects of this heavy inquiry, local irons selling on the basis of about $17 for No.2. One of the largest local interests has not been selling freely for the extended deliveries but has no iron for sale for early shipment.

Plates, sheets and pipe are selling somewhat better and as the spring advances a further improvement is naturally expected. Iron bars are in moderate demand this week but mills have heavy engagements and there is little or no iron available for early shipments. Steel bars are in steady demand, with some large transactions recently concluded. Inquiries for structural shapes are met with the disappointing response that for the present mill owners are so far behind in their orders that additional obligations can not be accepted. Merchant steel is in much the same conditions of mill satiety and late inquirers have a hard road to travel. A few rails are being booked for next December shipment.

Users of old materials have difficulty in buying for nearby wants. With the arrival of warm weather large receipts of scrap are anticipated but just now demand exceeds supply and prices are strong for almost all grades.

CURRENT QUOTATIONS:

Bessemer.............	18 00	18 50	Sheets, 26 store.....	8 25	8 30
Fdry Nohn 1.......	17 50	18 00	No. 27..................	8 35	8 40
Northern 2..........	17 00	17 50	No. 28..................	8 45	8 50
Northern 3..........	16 50	17 00	Angles............	1 75	
Southern 1..........	16 15	16 90	Beams..................	1 75	
Southern 2..........	15 65	16 40	Tees.....................	1 80	
Southern 3..........	15 15	15 90	Zees.....................	1 75	
Forge..................	14 50	15 40	Channels..............	1 75	
Charcoal..............	20 00	20 50	Steel melt'g scrap	14 50	15 00
Billets, Bessemer..	30 65	32 00	No. 1 r. r. wrought	17 00	17 50
Bars, iron............	1 75	1 80	No. 1 cast, net ton	12 50	13 00
Bars, steel...........	1 65	1 75	Iron rails..............	22 00	23 00
Rails, standard.....	28 00		Car wheels...........	16 50	17 50
Rails, light..........	31 00	34 00	Cast borings.........	6 00	6 50
Plates, boiler.......	1 90	2 00	Turnings..............	11 00	11 50
Tank..................	1 75	1 80			

BIRMINGHAM—In spite of statements to the contrary, the Southern pig iron market has not maintained a conservative attitude the past week to ten days. It looks very much as if the anxiety of buyers to cover wants has resulted in a state of bewilderment. It is understood that $12 per ton for five thousand tons of No. 2 foundry was offered and refused last week, that certain amounts of No. 1 soft sold at $14 per ton, and it is a well known fact that a number of small lots of grey forge brought $12 per ton, the nominal basis for No. 2 foundry. William Christie Herron, the Cincinnati member and manager of the firm of Rogers, Brown & Company, who was in Birmingham last week, said he saw no indications of a let-up in the buying activity and could not see but that prices must necessarily go higher. He ascertained while in Birmingham that lots of grey forge were selling at $12 per ton f. o. b. cars at the furnaces. The local foundrymen at Birmingham sized up the coming advance and many of them have supplied themselves for the remainder of the year at an advance over the market quotations. As a matter of fact, the market is ruling at 75 cents to $1 over the nominal quotations, especially for spot iron. The furnace companies are out of the market for six months to come except a good price is obtained. No one can tell what the price will be in the next week, this being dependent upon the attitude of the buyers. It is their market and, if they do not watch out, they are going to shoot prices up much higher than would be comfortable. In the South, as in the North, one of the remarkable features is that in spite of the increase in production, home takers are found for every pound of output and exports are almost nil. When the Louisville and Nashville Railroad had to go abroad for 30,000 tons of steel rails, the healthfulness of the domestic situation in the South can be imagined.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn.....	$12 00	12 50	Tank.....................	1 80	
No. 2 fdy, Sohn.....	11 75	12 00	Steel smelt'g scrap	14 00	
No. 3 fdy. Sohn.....	11 00	11 25	No. 1 wrought......	14 00	
Grey forge, Sohn..	10 50	10 75	No. 1 cast.............	12 00	
Billets..................	27 00		Iron rails..............	16 00	
Iron bars..............	1 70		Car wheels...........	15 00	
Steel bars.............	1 70		Cast borings.........	6 00	
Light rails............	38 00		Turnings.............	6 00	
Angles..................	1 75		No. 26 sheets........	3 00	3 50
Boiler plates.........	1 90		No. 28 sheets........	310	3 50
Fire box...............	2 00				

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lot of 100 pounds, $1.10 per lb.; special price on large lots.

Coal.

PITTSBURG—The approach of the conference on the wage question and the matter of freight rates and prices for lake shipments maintain the acute interest in the trade. The wage problem, however, seems to have been virtually settled at the Indianapolis convention, so that there is no fear of results from that quarter. The question of freight rates and cost of fuel at the lake distributing and consuming points in a more serious affair and March will be a month of more or less anxiety. The movement of coal locally is not up to the standard because of the railroad weakness in handling trains but there is a fair average maintained.

CLEVELAND—The anticipated break in the attitude of the shippers and vessel owners over coal rates for the season has not followed the lead of the men engaged solely in the ore carrying trade. The wise ones, however, expect that there will be some change shortly as the contract making season is at hand and the shippers seem to be in grim earnest. The vesselmen are figuring upon the assistance they will get from the increase of 7 per cent in the heavy ore movement. Just now it looks as if the vesselmen would gain a point or two in the settlement of rates.

CINCINNATI—An advance of fifty cents a ton was decided upon at the last meeting of the Coal Exchange, but the agreement is not being lived up to by a number of sellers. Shipments by river will likely resume in a few days, as the weather has moderated, though stock are low and shipments by rail are the only source of new supply. However, the demand is not as great as it was during the cold spell and but little fear of a famine is entertained. At nearby points of consumption the situation is more tense than here and a number of factories have been forced to close on account of a scarcity. Delivered prices are as follows: Nut and slack, $1.75; run of mine, $2.25 to $2.50; lump $2.75. Domestic lump, $3 to $3.50.

CHICAGO—The coming lake trade is interesting the large Eastern bituminous producers and meetings are in progress to make the season both profitable and harmonious. The reduction of upper lake docks to few ownerships is making easy their preparations. New methods of handling the coal at upper lake parts will probably be adopted. While Pittsburg rail coal is in fair supply in the West—fair only in comparison with the late protracted scarcity—products of West Virginia and Ohio continue far below wants and all manner of trouble ensues. Western coals are in fairly good supply and prices are without notable change. Coke is wanted badly by a variety of consumers who are not getting their usual supplies and prices are very firm with upward tendency.

Coke.

The week improved in production and especially in shipments in spite of the continued severe weather up to the close of last week. The scarcity of room for storage held down the production as compared with what it would have been otherwise. The shipments suffer so badly even if as the railroads were practically at a standstill for some days and are just now merging from their predicament. The week's movement slowed as the days went on and at the close the situation was as bad, or worse, as at any time since the transportation problem became so exasperating to coke makers and consumers. The furnaces kept up a continual cry for more coke which it was impossible to furnish. As in all other lines of production connected with iron and steel the consumers of furnace and foundry coke have resorted to offering all sorts of premiums for fuel but without getting enough to keep stacks in full operation.

A summary of the Connellsville region for the week shows 20,459 ovens in blast and 827 idle.

The following figures show the scope of operations.

Production for the week	224,830 tons.
" last week	224,721 tons.
Increase	109 tons.
Shipments—	
To Pittsburg and river points........	3,959 cars.
To points West of Pittsburg........	4,805 cars.
To points East of Everson............	2,100 cars.
Total	10,864 cars.
Last week	9,241 cars.
Shipments in tons for week........	243,924 tons.
" " " last week........	205,612 tons.
Increase	3,8312 tons.
Masontown Field	
Shipments for week	482 cars.
" last week................	456 cars.
Increase......................	26 cars.
Shipments in tons..................	12,323 tons.
" last week................	11,856 tons.
Increase	467 tons.

Coke Prices.

Pittsburg—Furnace, $2.25@2.50. Foundry, $2.50@2.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Senega, $4.60.

The West Virginia Fire Clay Works, New Cumberland, W. Va., are distributing to the trade a neat mirror, pin cushion and calendar combined which makes a handy vest pocket article.

The Metal Markets.

LONDON—Tin—£118 10s-£116. Sales, 490 tons spot: 1,630 tons futures.

Copper—£56 2s 6d-£55 10s. Sales, 1,550 tons spot: 3,350 tons futures.

Lead—£11 15s-£11 12s 6d.

Spelter—£17 17s 6d-£17 15s.

NEW YORK—Tin—$26.00-$25.37½.

Copper—Lake, 12⅝; electrolytic, 12½-12⅜; casting, 12⅜.

Lead—$4.10-$4.00.

Spelter—$4.25-$4.12½.

ST. LOUIS—Lead—$4.05.

Spelter—$4.15-$3.95.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including February 24, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUN
Transit	547,255	282,419
Tidewater	176,603	62,891
Southwest	41,490	197,253
Eureka	35,257	701,828
Buckeye, Macksburg oil	1,215	259,314
New York Transit	360,941	
Southern	467,404	....
Crescent	116,337	....
Total	1,746,502	1,408,200
Daily averages	75,972	65,724

LIMA.

Buckeye / Indiana Local Division	1,362,466	890,679
Daily average	59,141	44,584

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
February 19	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
February 20	1.30	1.15	1.15	0.83	0.80	0.80
February 21	1.30	1.15	1.15	0.83	0.80	0.80
February 22	1.30	1.15	1.15	0.83	0.80	0.80
February 24	1.30	1.15	1.15	0.83	0.80	0.80
February 25	1.30	1.15	1.15	0.83	0.80	0.80

Wire and Nails.

Wire, plain, car lots, jobbers	$2 05
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 25
Cut nails, less than car lots, retailers	2 35

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10 c
Copper, light bottoms	8 c
Heavy Composition	9 to 10½ c
Brass Turnings	6½
Heavy Brass	7 to 7½ c
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	$3.00
No. 1 Pewter	16

OBITUARY.

JOHN KELLY.

John Kelly, aged 92 years, father of John T. Kelley, of the Kelly & Jones Company, died suddenly February 21 at his home in New York. His death was due to old age. Mr. Kelly was for almost half a century a resident of Allegheny moving to New York about 12 years ago to live with his son. He was born in Ireland and came to America when a young man. He located in Allegheny in 1845, and conducted a store in Ohio street. He is survived by four sons, John T. Kelly of New York, president of the Kelly & Jones Company: W. J. Kelly of Chicago, secretary of the same company; and Joseph and William, both of New York.

Tube Mill Device.

In expanding long billets to form seamless tubing, the forward end of the shell is unrestrained so that it was free to drop down on to the supporting bar for the plug. By reason of the high rotating velocity the end was free to vibrate and whip violently around the bar, tending to distort the hollow billet and injure the bar. To overcome this, William Dicks, of Beaver Falls, has just patented a simple device and assigned one-half interest George H. Blaxter, of Pittsburg.

The tube mill is of substantially the ordinary general structure. The piercing plug is midway between the horizonal centers, arranged with relation to the disks to penetrate the billet as it advances. The plug is secured upon the end of the usual bar that is supported by a guide frame located in convenient relation to the disks.

The invention consists in a tapered bushing slidably mounted upon the bar and adapted in its initial position to enter a bearing opening made for the purpose in the guide frame, closely adjacent to the plug, so that the plug is positively and accurately held in alignment during the first movements of the piercing operation. The bushing is circular in form, and tapers sufficiently to permit its forward or contracted end to enter the hollow end of the pierced billet as it advances. As the billet continues to advance, it will push the bushing ahead of it out of its bearing in the guiding frame, and along the bar to the limit of travel, or until the billet is finished. The bushing constitutes the central bearing for the billet and will hold it steady, overcoming the whipping action. After the rolling, the bar and hollow billet are removed, and the bar and bushing adjusted in position ready for another operation. The device may also be employed where an already pierced billet is passed over an enlarged plug.

The Engineers' Banquet—The Engineers' Society of Western Pennsylvania held its annual banquet at the Hotel Schenley, February 21. At the society's banquet last year the plates covered were 187 in number. Friday the plates numbered about 300. The menu card proved "the book of the occasion of the annual banquet 1902" and was alike unique and artistic. The tables were a conservatory of flowers—cinerarias, freesias, ferns of many kinds and roses in red, white and pink. The engineers had laid aside their drawing boards for an evening of fun, and they wanted no Wagnerian music. "Coon" songs and ragtime melodies were interspersed, and sandwiched between the two came original Pittsburg songs by Stephen C. Foster. Whenever the diners heard a new strain they joined in singing the air, even if they had to quit eating. The speechmaking that followed the feast was just as jolly as the feast itself. It was after midnight when the last toast was announced.

Victor Beutner, well known as a wit as well as an engineer, was toastmaster. The first speaker he introduced was E. B. Taylor, fourth vice president of the Pennsylvania railroad lines West, whose topic was, "Good Roads." Mr. Taylor said that the opening theme was a particularly appropriate one, as good roads might prove of great convenience in enabling the engineers in getting home from the banquet. Becoming serious, Mr. Taylor said that until the suburban towns were connected with Pittsburg by better roads, and become more closely identified with Pittsburg interests the annexation of those towns and the formation of a Greater Pittsburg was out of the question.

Rev. W. J. Holland, D. D., director of the Carnegie museum followed. In presenting him Mr. Beutner said an old philosopher had held that there were but two problems in life—the production of wealth and the distribution of wealth. The toastmaster wished to add the third—the expenditure of wealth. He did not think that a proper expenditure of wealth was made when it was used in betting on prize fights or taking chances at Monte Carlo. The house came down uproariously. Current newspaper articles that education was a handicap to a young man's success Mr. Beutner could not approve. None but the educated, he said, enjoyed life. If he had the choice between education and wealth and wealth and education, he said, he w as very willing to stay where he was.

Dr. Holland told the engineers if they wished to learn something, they should study the spider. A spider, he said, would do an amount of work and carry a load that would stagger even a Pittsburg engineer.

Capt. D. P. Jones, retired, of the United States navy, who is making his home in Pittsburg, spoke of "Pittsburg's Contribution to our Naval Defense." Toastmaster Beutner, in introducing him, said that the bulk of the whiskey drunk by the 'jackies" was distilled in the Pittsburg district, and of the tobies they smoked 80 per cent were made in Pittsburg and the rest in Wheeling, which was a suburb of Pittsburg. Capt. Jones kept the house in a furore of laughter, for a while with his sea stories and then he began paying compliments to Pittsburg, which, he said, was destined to become the greatest industrial city in the world—and deservedly so. C. F. Scott, president of the society, spoke on "Our Society," George S. Davison on "The Elevating Tendencies of the Engineering Profession," and Dr. W. B. Phillips, director of the geologic survey of Texas, on "A Texas Dogie."

The committee of arrangements consisted of N. C. Wilson, chairman: H. J. Glaubitz, W. A. Coster, W. H. Perkins, S. M. Kintner, J. W. Landis, E. Yawger and L. A. Taylor.

The Spring Combine.

The formal transfer of the properties to be taken by the new American Railway Spring Company, the merger of the spring manufacturing concerns of the country, is to be made in New York. Payment for the properties will be to the different corporation stockholders for their shares in the various corporations at that time, and as soon as this is done the formal organization of the combine will take place by the election of a board of directors and a corps of officers.

The new company, which was promoted by Pittsburgers and which will include the French Spring Company, of this city, and the steel spring department of the Crucible Steel Company, in the Anderson-DuPuy works in this city, has arranged for the care of all its new capital stock, amounting to $10,000,000 of preferred and $10,000,000 of common, during the past week.

Frank B. Smith, the originator of the corporation was solicited to become president of the combination but he declined to consider it. Mr. Smith has declared it his intention to remain with the Crucible Steel Company, of which he is the secretary and treasurer. The office of president has been tendered to Jules French. of Cleveland, who has been identified with the A. French Spring Company, of Pittsburg, for years and has been one of the active managers of the business. The new corporation will have general offices in New York.

The new spring combine will not enter the raw material market except as a buyer. This is stated positively. The company will buy its

rucible steel from the general market and probbly its largest supply will come from the Crulble Steel Company, the principal producer of his grade of steel. It is understood that the rucible Steel Company will retain a large interst in the new company, taking as its share of he purchase price of the Anderson-DuPuy plant he common and preferred stock of the new ompany.

Under the present arrangements of those in harge of the organization of the new company he business of the various spring plants will ass into the control of the new officials larch 1.

The Oldest Steam Engine.

Last summmer, much to one's surprise, while t the Glasgow Congress of Engineering. and diected by the excellent handbook prepared for he guidance of members of the Congress, a real ve Newcomen engine was discovered at a colery at Rutherglen, near Glasgow. It is almost ertainly the oldest engine now at work and is eally a quite remarkable case of the survival of he unfittest.

A few years ago an engine of James Watt's manufacture, with sun and planet wheel comlete, was taken down at a London brewery. It as been continuously working for 102 years, and as not at all decrepit when dismounted. It ow forms an archæological exhibit in the musem of Sydney University. But this engine, hough interesting and of about the same age as he Glasgow Newcomen, was of a comparatively odern type. It did not represent an extinct ace.

The Newcomen engine at Farme colliery, utherglen, was built in 1809. and has worked ontinuously to the present time. As it was contructed long after Wattt's invention of the sepate condensor, it may, perhaps. be inferred hat one object in its design was to escape payent of royalty. Curiously enough, unlike all ther Newcomen engines of which there is recrd, it is a winding, not a pumping engine. he cylinder is of pure Newcomen type, but here is a modified Watt parallel motion with the adius bar above the beam, and a crank and flyheel of comparatively modern type.

The cylinder is 3½ feet in diameter, and the troke 6 feet. It takes about thirty-five seconds o raise coal from the bottom of the pit to the round level. The cylinder was never bored, but has now a beautiful internal surface, having orn out probably a thousand packings. The iston is packed with hemp gasket, and carries layer of water on top, which makes it quite team tight. There is no automatic valve gear. single handle, worked by a man, opens alternately the steam and injection valves. There is no air pump. Gravity and the pressure of the incoming steam drive out the condensed steam and injection water through a flap foot valve. It is stated that except brasses and one or two spur wheels, broken by accident, no important part of the engine has been renewed since it was built.

The beam is about 17 feet long and the flywheel is 15 feet in diameter. There is a feed pump worked from the beam. The latter is carried on a masonry pier. The engine works quite smoothly and well, and, strange as it may seem, it is probably, for the intermittent work it is doing, not so extravagantly wasteful as might be supposed.—W. C. Unwin in Cassier's Magazine for March.

Probable Coal Merger.

Plans for another and wider merger of coal producing companies is taking the attention of financiers who are interested in the exploitation. The scheme embraces the Pittsburg Coal Company, the Monongahela River Consolidated Coal & Coke Company, and practically all of the competing interests of these companies in the Ohio, West Virginia and Illinois fields.

Conferences have been held during the week by officials of the two Pittsburg coal combines, at which representatives of leading New York financial houses were present. From some of the Pittsburg stockholders of the river combine it was learned that the plan for one gigantic combine of all of the larger bituminous coal companies had been revived. The preliminary steps to this end are said to be in the recent incorporation of the combines of the Central Pennsylvania and West Virginia companies, such as the Fairmont Coal Company and the proposed consolidations in Ohio and Illinois.

One of the next steps, according to the coal men, will be the merging of the two big Pittsburg coal companies into a single headed corporation, the rumor of which has been current so often and so persistent during the past year, as to make it seem threadbare of interest. The merger, however, is now spoken of with more sincerity than before. The combining of these two corporations will unite the two capitalizations—the river combine with $30,000,000, and the rail combine with its $64,000,000, or a total of $94,000,000. The other corporations that are slated for this final merger will, in the rough estimate, make a combined capital of over $250,-000.000.

The merging of all of the coal mining corporations as proposed in the present instance is claimed to be one of the best possible moves of the coal interests to prevent unnecessary price cutting.

Big Power Generators.

The largest electric generators ever made are being delivered from Pittsburg to the Manhattan Elevated railroad in New York. It is three years since this company decided to change from steam to electric motor power. Contracts were let soon after the decision was reached.

The Westinghouse Electric & Manufacturing Company, of this city, was awarded the contract for the electric machinery. After consultation it was decided to attempt larger generators than had ever before been made, each will have 8,000 horse power.

The generators for the New York company are almost twice as large as those at Niagara, and eight of these monsters will be installed in the plant. With each generator is a pair of engines of 12,000 indicated horse power. These engines are of the Allis-Chalmers Corliss type and stand 41 feet high. The generators are almost as high as the engines, but in the power house will stand half underground, so that their tops will be on a level with the middle of the engines. This plan of construction allows the shafts to come just above the floor.

The shafts are of nickel steel, forged in the Bethlehem 15,000-ton press, and are 37 inches in diameter in the center, 34 inches in the bearings, and 30 inches in the cranks. They are hollow with a 16-inch bore, as a solid shaft would be too heavy.

The central load that will be carried, including the magnetic pull, will be about 440,000 pounds, or about 266 pounds to the square inch, when the engines are developing 12,000 horse power. The maximum fiber stress from bending and twisting will be 4,200 pounds to the square inch. The weight of each shaft is more than 60,000 pounds.

These huge machines were designed by Charles F. Scott and Benjamin Lamme of this city, of the Westinghouse Electric & Manufacturing Company. They planned the generators for the Niagara Falls Power Company, and their accuracy is attested by the fact that seven years of operation have suggested other changes. The Manhattan power house equipment also includes the Perry automatic smokeless stoker, another Pittsburg device.

A notice has been presented to Sharon contractors and mill managers employing bricklayers and masons of a new scale to go into effect March 1. The scale is one adopted by Bricklayers and Masons' International Union No. 14 of Sharon.

New Pneumatic Tool

John W. Birkenstock, of New York, has patented a pneumatic tool in which he employs the usual cylindrical casing closed at one end by a head that carries a handle. The casing is divided into two compartments, one slidably mounted a piston carrying a hammer like extension arranged to strike the end of the tool shank in a socket in one end of the casing. In the other chamber is slidably mounted a valve comprising a hollow tube carrying projections that extend into the piston chamber arranged to be engaged by the piston during its reciprocation. The valve has inlet ports alternately opened as it is slid back and forth by the piston. Air is conveyed to the valve through suitable ports communicating with a nipple arranged to be attached to any suitable source of compressed air, and at this nipple is located a controlling valve operated by a lever fitted in a groove or seat in the handle. The entire structure is very simple, and is under the complete control of the operator.

Opened a Pittsburg Office.

F. R. Phillips & Sons Company, of Philadelphia, have opened an office at No. 339 Fifth avenue, Pittsburg, where F. Rees Phillips will be permanently located. They find this necessary to take care of the largely increased business in this section. They have of late taken several contracts for sheet and tin mills, machinery, chilled rolls, etc.

In connection with their foreign business they have imported considerable steel of late and placed orders for a very large tonnage principally for Eastern mill, and with their Pittsburg office they will be in a position to deal directly with Western mills.

Plans are in preparation by the Pittsburg Stove & Range Company for a plant at Beaver in which will be concentrated the scattered works controlled by the concern. The company has bought 23 acres on College Hill, Beaver, and is providing for a modern foundry and machine shop. Nine plants in this district are in operation, all of which will be abandoned upon the completion of the new works.

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 [illegible]
Bessemer Steel, 100 lbs.	4 [illegible]
Bessemer Steel, 95 lbs.	4 [illegible]
Bessemer Steel, 90 lbs.	4 [illegible]
American Charcoal Terne—I. C., 14x20 ordinary	4 [illegible]
I. C., ordinary	9 [illegible]

American Coke, f. o. b. mill, quoted at $4.25 for full w[illegible] 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4.00 for 90 [illegible]
Foreign Coke Tins, I. C., 14x20 (for importation,) Bess[illegible] Steel, full weight, $4.90 Bessemer Steel, 100 lbs $4.75.

Ore Situation at Cleveland.

Nothing is being done in making season charters for the movement of iron ore. The two factors are still standing at bay, neither caring to make overtures for further business, the shippers especially being backward. The shippers are displaying craftiness, implying by their movement that the burden of anxiety is with the vessel owners, therefore the advantage in making rates is with the man who is sought after rather than with him who seeks. Notwithstanding all that has been said there is an air of confidence among the vessel men that their cause will eventually triumph. They doubt the sincerity of the Steel Corporation in holding out for the 75-cent rate, and believe that only another conference is needed to clear up the sham fight.

The matter of dispatch has figured most prominently, and this has depended upon two things —the ability of the railroads to handle the material from the docks to the furnaces and the policy of the shippers as to chartering wild boats. The railroads form the greater factor of the two, since upon them depends the development of the capacity of the dock equipment. Without an exception they announce that more attention is to be paid this year to the quick movement of material.

The Wheeling & Lake Erie, which handles the ore away from the docks at Huron, will be in better position than ever to meet demands this year. The dock machinery is to be improved and added to so that it can handle more ore. In addition the road has purchased 2,600 cars, and more engines will be available for the ore movement. The docks will be provided with probably the fastest coal plant on the chain of lakes, consequently the increased number of cars, which come there with coal, will rapidly be turned over to the ore shippers. The facilities will be increased by at least 15 per cent.

The Cleveland, Lorain & Wheeling will be in a similar position. The reports have been numerous of late of the extension of the dock facilities at that port, and it is believed by those in authority that the docks there will be able this season to handle double the amount of ore that was shipped there last year. It is impossible to measure the equipment performances in advance but cars and engines enough have been provided to handle all of the ore and coal it is desired to send through that port.

The Pennsylvania which handles ore over the C. & P. dock in Cleveland will likewise be in position to handle considerably more ore than it was able to do last year although very little fault could be found with the performances of the road then.

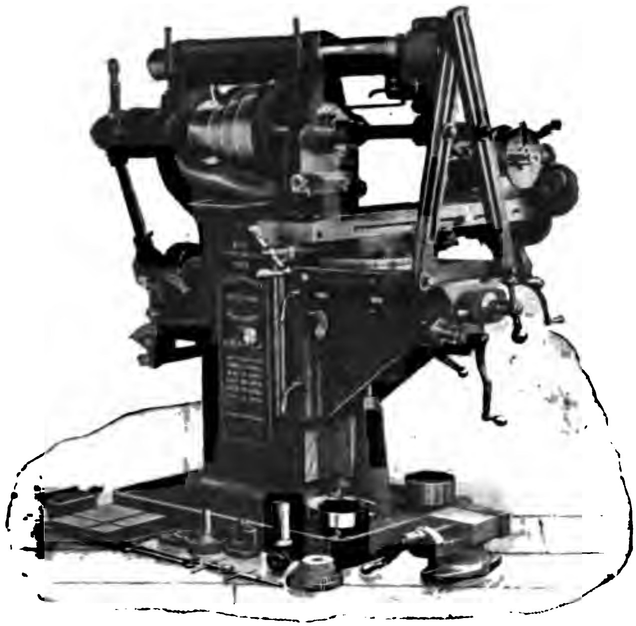
The Lake Shore which does most of the business out of Ashtabula has decided to increase the amount of equipment used on that branch of the road. This is made necessary by the fact that another big ore-handling device will be used there. In addition the P. & L. E. which has been handling the Lake Shore and the Erie ore South of Youngstown, is to have four tracks instead of two into Pittsburg, which will enable other roads to send their cars through faster than they have been doing heretofore.

At Fairport the announcement is made that there will be an addition of a clam-shell ore unloader, which will be able to lift a great quantity of material. The P. & W. will arrange to take care of this by increasing the equipment that is to be available. As the B. & O. owns the road the rolling stock of the B. & O. may be put into use to meet the demands through that port.

The Bessemer & Lake Erie is mostly responsible for the movement away from Conneaut. The reports are that its car supply will also be increased. It is known that the tracks will be doubled for a longer distance from the terminals, and that it is the intention to immediately start to double the road for its entire length.

Marine men see no reason why the increased shipment of ore cannot be taken care of this year, and at the same time something be done to relieve the boats of the delays to which they were subjected a year ago. Those who believe in an over-production of boats will have occasion, before the season is over, to demonstrate the truthfulness or fallacy of their opinion, if the railroads live up to their present promises.

This Is The Miller



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It's positive too, there are no belts no slip. That means heavier and faster cuts.

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Lebanon Concern's Election.

Stockholders of the American Iron & Steel Manufacturing Company in annual meeting at the Lebanon offices elected the following board of directors for the year: Edward Bailey, Harrisburg; Arthur Brock, Horace Brock, Thomas Evans, C. M. Hallman, H. H. Light, James Lord, H. M. M. Richards, Lebanon; J. H. Sternbergh, H. M. Sternbergh, Reading, and William H. Wallace, Brooklyn, N. Y.

The directors subsequently elected these officers: President and general manager, J. H. Sternbergh, Reading; vice president, H. M. Sternbergh, Reading; manager of Lebanon plants, James Lord, Lebanon; treasurer, H. M. M. Richards, Lebanon; secretary, C. M. Hallman, Lebanon. The only change in the board of directors is the election of Edward Bailey, of Harrisburg, to succeed C. W. Wilhelm, of Reading. There is also a change in the executive, H. M. Sternbergh, son of President Sternbergh and manager of the Reading plants, succeeding Arthur Brock, of Lebanon, as vice president.

The second annual report submitted to the stock holders contained the following financial statement and president's report:

ASSETS.—Plant and equipment $3,597,846.73. Inventory of finished goods and raw materials on hand, valued at less than present market prices, $1,269,839.88. Cash on hand and in bank $104,169.02. Accounts receivable $512,784.98; total $5,484,640.61.

LIABILITIES—Preferred stock $3,000,000; common stock $1,700,000; accounts payable, including wages to December 31, $600,322.82; undivided profits $184,317.79; total $5,484,640.61.

Dividends paid during 1901 as follows: Dividend No. 5, Preferred stock $37,500; dividend No. 3, Common stock $85,000: dividend No. 6 preferred stock $37,500; dividend No. 4 common stock $51,000; dividend No. 7 Preferred stock $37,500; dividend No. 5 common stock $51,000; dividend No. 8 preferred stock $37,500; total $337,000

During the year 1901 the company manufactured 117,661 net tons of bar iron and steel. Of this quantity were sold 36,469 net tons merchant bar iron, and of the remainder were manufactured and sold 62,106 net tons of miscellaneous finished goods, bolts, nuts, rivets, etc. The total sales of all products for the amount of $4,754,560.36.

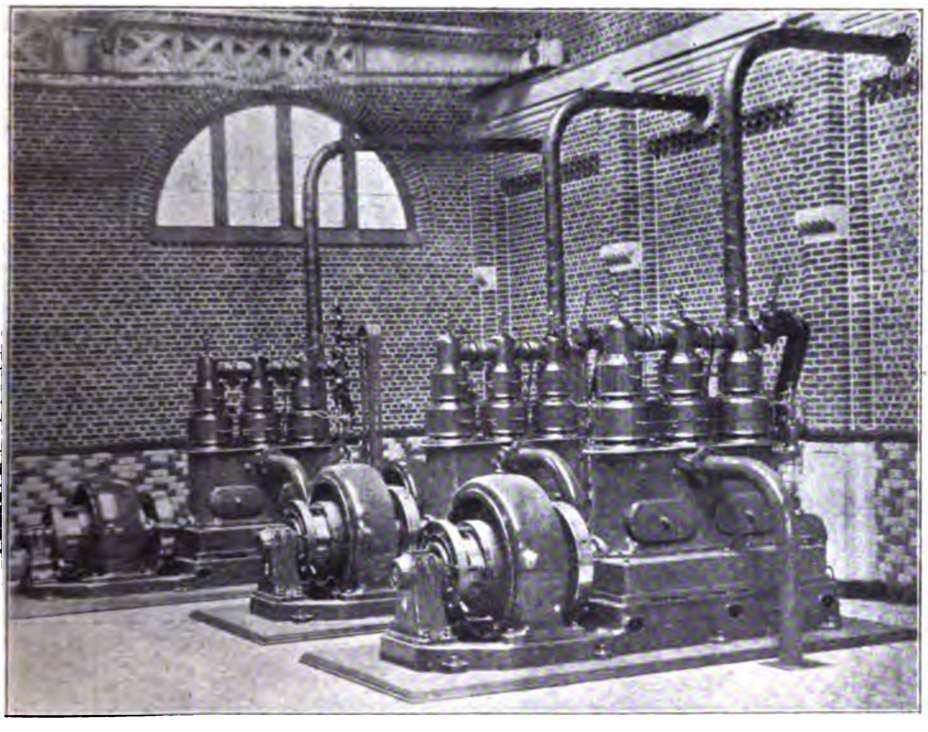
The company is obliged to practically rebuild much of the Central works, including the erection of a new nut shop, 201 x 184 feet, a new bolt shop, 201x150 feet, an additional warehouse 300 x 70 feet, an electrical power and pumping plant 95x60 feet, a water tower, 20 feet diameter 70 feet high, a pattern storage warehouse, 107x50 feet, a new bolt threading shop, 200x74 feet, a galvanizing shop, 10[illegible] feet, a new scrap iron shed, 230x80 feet, and other buildings, besides the complete re-arrangement of railroad tracks through the grounds for the more economical handling of materials, and the substitution of modern steam boilers and furnaces for the less efficient types heretofore used, and in general, the repairing of nearly all the engines and bolt and nut machinery at the Lebanon works. Much of this work has been done.

MODERN STEAM ENGINE PRACTICE ABROAD.

BY FRANK C. PERKINS.

IT is often of great value, as well as instructive and of more than passing interest, to consider from time to time what our neighbors abroad are doing in steam and electrical engineering and take advantage of any modern ideas which experience has proven successful in recent installations. It is remarkable to note the continually increasing size of steam engines in every country and a careful consideration of some of the methods and general design in modern central stations in England, France, Belgium, Germany and Austria, with accompanying illustrations, will give an opportunity for comparison with the latest American practice.

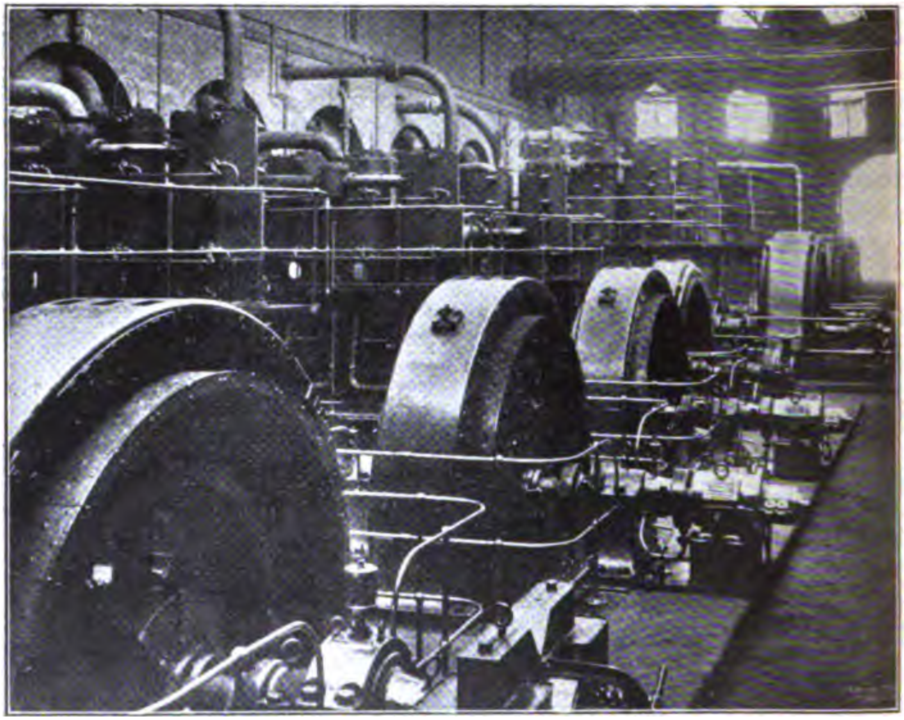
There is no field of engineering, where the steam engine is used extensively, which will serve to illustrate the modern high power units so well as in the the electrical installations for lighting. traction and general power distribution. On the continent of Europe, it is notable that the horizontal, slow speed engines are most frequently used although some other recent installations are equipped with vertical engines of large size. The high speed engines of the enclosed type which are so extensively used in England are scarcely to be found at all, and the reason horizontal compound and triple expansion engines are so univerasllv installed in Germany, Austria and other countries in Europe, is said to be largely on account of the ease with which their working parts may be looked after, as the engineers will take better care of the engines than if compelled to climb to a considerable height many times during the day. The finish is better and the machinery and general appearance of the



Brussells Ixells Station—Installed by Compagnie Internationale d'Electrique.

engine rooms is cleaner than those in England or America. Forced lubrication is not so extensively used as in England, but the plunger feed lubricators are adopted in preference to the sight feed lubricators on most of the engines in this country. The automatic oil bearings are at present being introduced in all countries alike.

Until very recently, the high speed, enclosed type of high pressure steam engines was used almost exclusively in English central stations and are still being installed even in comparatively large sizes. Some of the highest grade engines that have been produced were developed in the English shops as they required most careful design as well as first class workmanship on account of the high speeds employed. Among the prominent English engines may be mentioned the Willans, Bellis, Musgrave, Raworth, Allen, and Browett & Lindley, the vertical types being mostly employed, similar in design as in marine practice. Many important plants are still being installed in Great Britain with vertical high speed engines and the bi-polar generators, although multi-polar direct current machines and single phase and polyphase alterna



Leeds (Eng.) Corporation Electric Light Station.

tors are also being used in large sizes to some extent with horizontal compound and triple expansion engines. The accompanying illustrations are examples of English electrical plants operating with high speed enclosed engines, directly coupled to bi-polar and multi-polar direct current machines as well as polyphase alternators.

The plant of the Charing Cross & Strand Electric Supply Corporation shows 19 sets of Bellis & Morcom engines and bi-polar direct current machines of the Siemens & Company type, as well as several Lahmeyer generators, the total output being more than 10,000 horse power. Twelve of these units have each a capacity of 500 h. p. and are operated by three crank compound Bellis engines which are fitted with a system of forced lubrication. The lubrication is effected by means of a simple pump without valve or packing delivering oil to the bearings through a system of oil channels, while the escaping oil from the bearings, drains into the crank pit to be used over again.

The Belfast Municipal Electric Supply Works has a capacity of about 6,000 h. p., and includes 10 sets of the multipolar type. for lighting, traction and power work. The generators are of the Parker, Mather & Platt, and Johnson & Phillips make, a three wire system of from 440 to 500 volts potential being used, the units varying in size from 175 h. p. 550 h. p. The engines are said to operate very quietly and smoothly with little wear due to their high speed while a saving in space of nearly one-half is obtained over the slow speed machines of the same capacity.

The installation at the Leeds Corporation Electric Light Station includes 12 sets of triple expansion, three-crank high-speed engines having a total capacity of nearly 11,000 h. p. Five of these engines are of 500 h. p., six of 100 h. p. and one of 20,000 h. p. The generators which are direct connected to these engines are 2,000 volts alternators of the E. C. Company and Ferranti type, and supply current for both light and power purposes. Most of the English high speed engines are designed up to 400 h. p. as two crank compound machines, while larger sizes up to 2,000 h. p. are of the triple-expansion three-crank type. High speed engines of the English vertical type are built both open and closed and single and double acting. They are arranged as simple, compound or triple expansion. the Willans being of the single acting and the Bellis described above of the double acting design.

The piston speed of this double acting engine is quite low even though the number of revolutions is high, and the output is of course greater for the same cylinder capacity than the single acting engine.

The cylinders and cross head guides are cast in one piece, the latter being of cylindrical form, and piston valves are used, placed between the two cylinders which are side by side. The valve eccentric operates the simple oil pump giving a forced oil circulation the pressure being from 15 to 20 pounds per square inch. This exceedingly good lubrication, together with the excellent design and workmanship, results in a very durable outfit in spite of the high speed. To illustrate the slight wear on the working parts, it may be of interest to note that one of these engines operating a generator in a chemical works, operated for four years almost continuously without repairs, hot bearings or failure of oil supply, and with almost no wear. It ran in one year day and night 99.77 per cent of the total number of hours, the longest run without stopping being from July 1 to November 30 during which time the engine and dynamo made 83,000,000 revolutions without stopping.

Regarding the actual wear of these high speed vertical engines of high grade design and construction in England, the case of an engine and generator installed at the Tauton Corporation Electricity Works may serve the purpose. This engine after being operated three years, was taken apart and measured. The bearings and cylinder surfaces were in excellent condition with no signs of grooving. The wear on the other parts as measured was found to be as follows:—

Crank shaft main bearing journal 4-1000 inch to 6-1000 inch; low pressure crank pin, 10-1000 inch; high pressure cross head pin, 8-1000; valve rod cross head 6-1000; low pressure cylinder, 10-1000 inch; high pressure crank pin, 16-1000 inch; eccentric sheaves, 10-1000 inch; low pressure cross head pin 8-1000 inch; high pressure cylinder 6-1000 inch.

The total wear of the shaft and brasses, i. e., amount the bearing caps were let together was 16-1000 at the governor end and 21-1000 at the flywheel end.

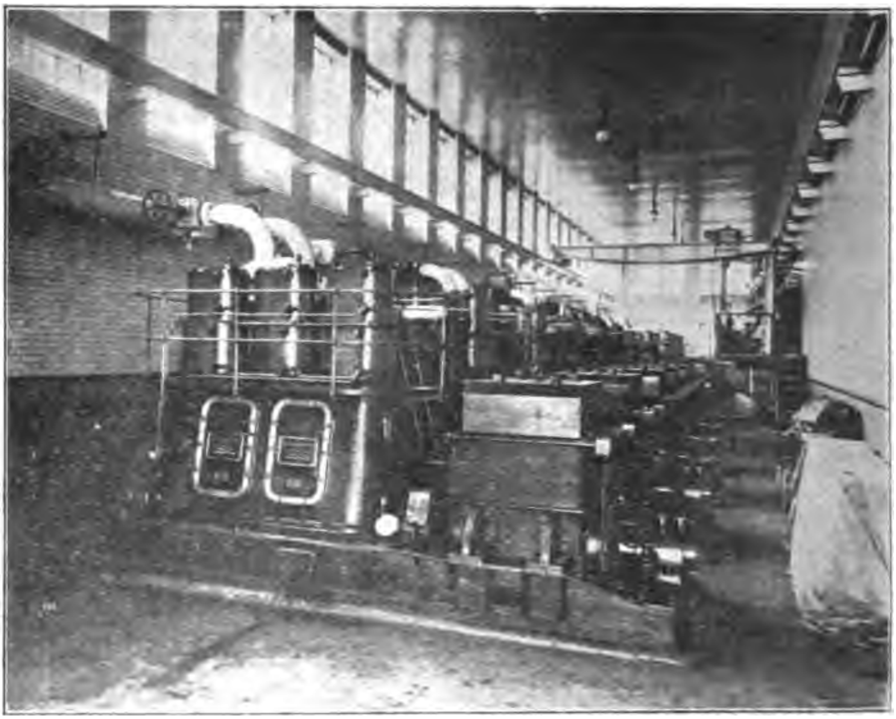
In Belgium as well as in England the high speed vertical engine is extensively used and the accompanying illustration shows a 40 kilowatt direct current generator built by the Compagnie Internationale d'Electrique, of Liege, Belgium, direct coupled to a vertical double crank compound high speed engine of the enclosed type.

The single acting Willans engine is also largely used in Belgium in many central stations for operating both direct and alternating current machines. The illustration fig. 5 shows a 150 h. p. triple crank high speed engine of this make operating a three phase alternator with its exciter mounted outside of the main bearing and direct coupled to the engine and generator shaft. In the Brussels Ixelles station there are three direct connected Willans engines and continuous current generators,

and for light and railway work the Liege station is equipped with 9 of these sets agreegating 1,300 h. p.

The Willans engines have hollow piston rods which contain the valves which are of the piston type. The steam enters the first cylinder through the hollow piston rod by the movement of the rod and valves and exhausts through the piston rod to the next cylinder. The wear and knock is avoided as the air is compressed above the piston on the up stroke and the pressure in the bearings is never reversed, and there is no loss as the energy is given back by the compressed air in the next stroke.

The Raworth vertical high speed single acting enclosed engine differs from the Willans engine in many ways. The working parts are few in number and easily adjusted and the engine is self draining and very economical on account of the short steamports. The high pressure cylinder is jacketed inside and outside with steam at the pressure of the receiver enclosing it. J. S. Raworth in his paper before the Manchester Section of the I. E. E. states that there seems to be a greater diversity of opinion in reference to steam engine design than in the construction of electrical



Charing Cross & Straud Electric Supply Corporation.

generators. In England he thinks the leading type to be the high speed three crank engine, in America the slow speed engine, and on the continent the one crank engine.

The three crank engine, i. e., the engine with a compound or triple expansion engine on each crank, has advantages in the matter of vibration but is not so economical of steam, due to greater leakage, length of piston ring, greater area of cylinder walls, and difficulty of applying automatic expansion. The turning moment is nearly constant. Mr. Raworth believes that the three crank three cylinder compound engine is likely to be used to a great extent in the future for large units up to 5,000 h. p., similar to those of Musgrave built for the Glasgow Tramways, and that the triple expansion engine very rarely has any great advantage over a compund engine for electrical work, the latter giving the best results with superheated steam.

The low pressure cylinders of engines like those of the Glasgow plant are but little larger than the high pressure cylinders, the engine being easily balanced. has an even turning moment at all loads and automatic expansion can be applied without trouble.

POSSIBLE IMPROVEMENTS IN THE GAS ENGINE.

"ENGINEER" IN THE GAS ENGINE.

SPECULATIONS on future improvements in any line of machinery are always feasible and lead at the least to profitable discussion even should the prophesies made fall considerably short of what will actually take place. While the writer believes he has good grounds for his several opinions, the future, like life itself, is uncertain, and the development may take other lines than those suggested herewith. If, however the cause of gas enginery is advanced the smallest fraction of a per cent by the following remarks the purpose of the article will have been fulfilled.

In the first place, the range of temperature which is at present the prevailing practice with the builder of the ordinary two and four-cycle engine will bear improvement, although considerable has been done in that line within the past few years. With steam engine practice the initial pressures in vogue in gas enginery compare favorably; but the fall of pressure in a gas engine commences with the beginning of the expansion stroke and the M. E. P. obtained is practically the same as that in the average steam engine having a moderate cut-off. The terminal pressure in the gas engine cycle is nearly as high as the initial pressure in many steam engines. Hence, considerable energy passes away through the exhaust passages. This makes it appear that there is room for improvement at each end of the expansion stroke.

In the Diesel motor the initial pressure has been considerably increased and the terminal pressure diminished by means of the unique cycle employed. Great things have been expected of this engine, but in spite of the encouraging reports we hear from time to time, it has not become a serious competitor among the prime movers of the world. Several gas-engine manufacturers, more daring than the rest, have carried the compression in the ordinary four-cycle engine to what appears to be a practical limit, and while it has brought them in contact with difficulties hitherto not experienced, the improvement in the ecomony of the engines has been thoroughly demonstrated. In the Sargent engine described in the January, 1901, issue of THE GAS ENGINE, the terminal pressure has been carried very close to that of the atmosphere with a consequent economy. The compound engine, often broached, occasionally attempted, and generally unsuccessful, has always seemed a comfortable way of solving this end of the problem. It may, in fact, be waiting only for the proper solution with which some plodding inventor will astonish us in due time. The use of a condenser is naturally suggested by its excellent results when used with the steam engine. Perhaps it may prove of service in connection with the high-power gas engines that are certain to be constructed in the near future.

In relation to the service that the condenser may give in connection with the gas engine it may be said that a terminal pressure very close to that of the atmosphere must be obtained. Then, by reason of the fact that the pressure of the exhaust may be lowered by cooling and contracting the hot gases and also by condensing the water vapor that is generated, it is probable that the terminal pressure may be reduced considerably below that of the atmosphere, although the terminal pressure of the condensing steam engine can not be expected. This is due to the presence of considerable quantities of nitrogen and carbon oxide which will remain in gaseous state when cooled by this process.

To the compression of the charge in the Beau de Rochas cycle there is a practical limit that is determined by the igniting temperature of the fuel employed. In the Diesel cycle this trouble is avoided by withholding the fuel until after the compression is completed. During the compression of the charge its temperature is raised both by the increase of pressure and the transmission of heat from the engine itself, and also by heat derived from the products of combustion remaining from a previous explosion.

Of course, it is usually considered as being conducive to the economy of gas en-

gines to prevent as much as possible of the heat generated from escaping through the walls of the cylinder, and a cold cylinder wall is not usually an aid to the economy of the engine. It is probable, however, that by keeping the cylinder walls compatively cool and driving out all the products of combustion before taking in a fresh charge, that the practical limit of compression could be raised and probably to the advancement of the economy of the engine in spite of the heat that would esape through the walls of the cylinder.

It is a fact that compression cannot be carried as far with gasoline engine as with one using a gaseous fuel, and this is in a measure due to the practice of heating the air before it enters the cylinder in order to assist in the vaporization of the fuel. It is generally admitted to be a fact that the cooler the charge can be kept until it enters the cylinder. the better will be the performance of the engine. in so far as economy is concerned. For this reason many manufacturers object to pre-heating air. Pre-heating the air not only increases the liability to premature explosions but it also expands the charge so that the amount which may be drawn into the cylinder is reduced. For this reason many gas engine builders insist upon keeping the inlet passages cool and water-jacket the inlet-valve casing.

The above remarks would suggest the adoption of methods of vaporizing the petroleum products with as little pre-heating as possible. This idea is already carried out in existing engines and its possible extension will be of assistance to gas enginery. Methods of scavenging without the use of complicated mechanism will also aid in the advancement of economy. Scavenging by the use of a considerable quantity of cool air would be of assistance in keeping the interior of the engine cool.

Improvements in the ignition devices employed are also in order and very few are the electric igniters that will not miss fire occasionally. It has been pointedly remarked that a large majority of the troubles with gas engines are due to poor electrical engineering. Methods of wiring and mechanisms that would not be countenanced by an electrician or electrical engineer of any experience are daily to be seen installed on gas engines. Switches and terminals that would not be employed except on electrical toys are often run across in gas engine electrical devices. At least one gas engine manufacturer who makes a specialty of a certain form of electric ignition device has defied competition in this particular line because no other manufacturer has been able to imitate him successfully. Yet the writer knows from personal observation that the system referred to has proven remarkably successful whenever turned out by the factory's electrician. Users of the jump spark system have troubles by the score and the greater number of these troubles are due to insulation. Yet the jump-spark system has been used for years in connection with gas lighting for public buildings; and the circuit problems involved are much the same as those in the gas engine outside of the igniter plug. Here is where one may find so many differences of opinion regarding suitable insulation. One manufacturer will use mica, and another condemn it. Another employs porcelain while another will have nothing to do with it. Still other insulators are being tried, and each has its advocates and its enemies. The trouble is not far to seek. Each insulator behaves differently and has advantages not possessed by another. For this reason they each require different treatment and intelligent selection. Again the use of the jump-spark for multiple cylinder engines is usually carried out by the employment of a separate coil for each cylinder. Commutating the high tension current usually gets the engine runner into trouble, and yet it would seem that this is a phase of the problem that is capable of intelligent solution. Then there is a marvellous difference of opinion in regard to the use of a coil with a magnetic vibrator. If you are a mechanic in the proper sense of the term, a glance at the vibrators that are installed upon many of the coils would show the reason for the aversion to them. Here again comes in the toy feature of electrical appliances offered for use with gas engines. Is it not better to pay a higher price for a good coil than to buy an inferior coil simply because it is cheap? The ratio of this difference in price to that of the engine itself is very small indeed, although the highest priced coil the writer knows of costs $26.00, and the lowest priced $6.00. There is an opportunity for improvements in both coils and plugs, even though there are excellent ones on the market at present.

The electric battery is also another auxiliary that is susceptible of improvement. If light, its life is short; if its life is long, it is heavy. While there is an expensive cell that appears to embody long life with light weight, those in average use are far from ideal in this respect.

The whole subject of electrical ignition seems hardly to have received the attention it deserves. The time of contact in variable speed engines is the same at all speeds. Current is wasted through faulty methods both of wiring and insulation. The battery is called upon for a wasteful output of current which lowers its efficiency and useful life and the resistance of the exterior circuit is seldom adapted to that of the battery.

That other source for current, the dynamo, is also a neglected feature. Many of these instruments are foisted upon the gas-engine builder and used by parties who know little more than the first principles of electricity, and the ignorance of the gas-engine builder himself permits him to be deceived by appearances and prices. Toys again, brush holders and windings that would bring blushes to the cheek of any dynamo maker of standing, if they were to be found on his premises. Even the experienced dynamo builder, ignorant of the requirements of gas engine service, will occasionally risk his reputation by marketing a machine totally unfit for the purpose. The current furnished will ignite the charge very nicely, but the electrodes will gradualy disappear. Yet a nicely balanced dynamo will furnish current for an igniter for months with scarcely a perceptible corrosion and without the use of other than steel terminals.

In spite of the admitted success of the steam turbine, very few inventors have turned their attention to turbines driven by the direct combustion of gaseous fuel. Possibly not over twenty patents altogether have been taken out in this line, and yet it would seem that the future for such a machine is full of promise. The true rotary engine would probably be as barren of results in gas enginery as it has been in steam enginery. Again, there are possibilities perhaps in a well-balanced gas engine and gas producer plant in which the heat now wasted through the water-jacket and the exhaust could be turned into useful channels. Perhaps a gas producer will be developed that may be used on shipboard instead of the boiler and the vessel driven by means of producer-gas engines with the same certainty that they are now driven by steam engines. Attention will then necessarily turn to the securing of more power per revolution and per unit weight of engine than is the case at present. Of course, the liquid fuel engine does away with the gas producer for this purpose, but liquid is not obtainable in every port. One great advantage could be obtained by the use of a producer capable of employing a wide variety of fuels and present developments in this line appear to promise just such a device. It will be the introduction of gas engines in units aggregating horsepowers in four figures that will call for minor improvements now not considered advisable in the smaller engines in general use today. Then an increase in efficiency of even one per cent will receive serious consideration, where in a small engine it would not be worth while. It is probable that, without complicating its mechanism unduly, an engine may be developed in which the piston will receive alternate impulses on both sides, and possibly even every stroke, thereby getting four times the work out of a cylinder and engine of a given size and speed, as is at present commonly obtainable. When this day shall have arrived, the steam engineer will have to look to his laurels that he has so worthily won and so gracefully worn for the last one hundred and twenty years; for in the double-acting, high speed expansion gas engine, he will find an active competitor, both on land and at sea.

Small Engines Needed—A demand has come to Consul Norton, Harput, for small, portable steam enignes, 1 to 3 horse power. They are desired to replace hand power in several of the local industries. Wood is the only available fuel. The entire plant, boiler and engine, should be compact and easily portable. The American agency there would gladly receive correspondence and price lists for such engines and boiler outfits, with agents' rates. Communications can be sent in the care of the consulate The Post-office address is Mezreh, Mamouret-ul-Aziz, Turkey in Asia.

THE MESABI GEOLOGY.

At the meeting of the Geological Society of Washington, held in that city January 22, Mr. C. K. Leith described certain new features in the geology of the Mesabi iron bearing district of Minnesota, which have appeared as a result of recent work by the United States geological survey.

The Keewatin series of the Minnesota survey has been sub-divided by the survey into a lower igneous basement, corresponding to the archean or basement complex of other parts of the Lake Superior region, and an upper well-defined sedimentary series resting unconformably upon the lower rocks and corresponding to the Lower Huronian of other parts of the Lake Superior country.

The upper of the two sedimentary series of the Mesabi district containing the iron ore (the Animikie of the Minnesota survey; the Upper Huronian of the United States geological survey) comprises three lithological units—a quartzite below, an iron formation in the middle horizon, and a slate above—all previously supposed to be conformable. It is now found that structurally the series is a dual one—a quartzite below (Pokegama) separated by a slight unconformity from an iron and slate formation above (Biwabik and Virginia formations.) The Biwabik iron formation contains quartzite and conglomerate at its base and grades both upward and laterally into the Virginia slate. In the fullness of its succession and in the clear cut nature of the unconformities, the Mesabi district may stand as the type pre-Cambrian district of the Lake Superior region.

The most interesting of the late developments concern the origin of the iron ores. They have resulted from the alteration of certain rocks containing green granules, which, on analysis, prove to be essentially ferrous silicate. They lack potash, and therefore cannot be glauconite and of organic origin as supposed by Spurr.

The iron-bearing formation bears clear evidence of sedimentary origin, and it is believed that the origin of the green granules making up the original rock is closely similar to that of the cherty iron carbonates which are the original rocks of the iron-bearing formations of other portions of the Lake Superior region. The iron, probably derived from the leaching of the archean basic rocks, was carried in solution, mainly in the form of carbonate, though perhaps in part as sulphate, to the ocean, in which iron formation material was being deposited. There the carbonate of iron was thrown down by oxidation and hydration as limonite. The limonite settled and became mingled with organic material, the presence of which is shown by the association with carbonaceous slates, and was reduced to the protoxide form. The simultaneous decomposition of the organic material freed carbon dioxide. Silica also precipitated (chert is known to develop under such conditions) probably through the agency of organisms. Both of these substances could combine readily with the iron protoxide, but in the case of the Mesabi rocks the main combination was the protoxide, and silica, giving the ferrous silicate which we now find. The ferrous silicate took the form of granules in the same way that oolites take their form.

When the iron formation was brought above the ocean, the ordinary weathering agencies began to alter the ferrous silicate of the iron formation. The iron was oxidized, or oxidized and hydrated, and was concentrated and separated from the silica, through the agency of underground waters. The deposits are now found in gently pitching troughs in the iron formation, bottomed by thin slaty layers, now largely altered to paint rock, which serve, and have in the past served, as channels for the circulation of underground water. The channels have the irregularity and complexity of ordinary surface drainage channels. A conspicuous feature is their general flatness, as a consequence of which the areal extent of the ore bodies is very great as compared to their thickness. Seldom is the depth greater than 300 feet, while the horizontal dimension is usually many times that figure. In this the Mesabi differs from the old ranges, where the ore deposits have much greater vertical dimensions and correspondingly smaller horizontal dimensions. The difference in areal extent is shown by the fact that the ore deposits in the Mesabi district occupy perhaps four per cent of the total area of the iron-bearing formation, while in the old ranges the

ore deposits occupy but a small fraction of one per cent of the area of the iron formation.

The Mesabi ore deposits never extend to the South under the overlying black slate, and moreover lie approximately in middle slopes of the Giant's Range, very largely between elevations of 1,450 and 1,650 feet above sea level. The explanation of this occurence concerns the flowage of underground waters which have concentrated the deposits. It is thought that it can be shown that such waters have their most vigorous circulation on the middle slopes of the range, and that the circulation beneath the black slate to the South is not so vigorous. Water coming down the South slope of the Giant's Range enters the edges of the gently Southward-dipping iron formation strata, and flows down the slope. Under the black slate the water backs up to a certain extent, as shown by the pressure with which water comes to the surface through drill holes which pierce the overlying slate. Much of it must come to the rock surface before passing under the Virginia slate. The iron ores are thus not only confined to the gently pitching troughs controlling the water circulation, but are confined to those parts of the troughs not covered by the Virginia slate where the circulation has been most vigorous.

The phosphorus in the ore deposits is a residual product and not a concentration. The original rock from which the ores have come contains a lower percentage of phosphorus than the ores.

Want American Gas Coal.

THERE is an increasing demand in Austria for a high-grade gas coal. Strange as it may seem, the production of artificial gas is advancing in that country. This is due to two different causes: First, the Auer incandescent gas-burner, an Austrian invention, which is in general use there, has greatly increased the efficiency of gas light, and in a measure, re-established the popularity of gas as an illuminant: second, the relentless war which is being waged against the smoke nuisance in many cities has led a large portion of the smaller establishments to employ gas as their motive power. The increased consumption of gas has made the erection of many new works necessary, especially in the larger cities, and has also greatly quickened the interest of gas experts in improved processes of production, as well as in new and more productive kinds of raw material.

In the past, the bulk of the gas coal consumed in Southern Austria has been imported from England. The present price of this coal f. o. b. Trieste, is about 19s, ($4.62), per ton, and the average quantity of gas produced from it is from 29 to 30 cubic meters per quintal, or about 10,500 cubic feet per ton. The total quantity of gas coal consumed in the Trieste district is probably about 300,000 tons per annum.

In a recent number of a German gas journal, the statement appeared that at a test made in London an American coal had yielded 15,900 cubic feet of gas per tons Such a coal, would be worth in Austria not less than $6 a ton.

Mr. Emil von Malberg manager of the Eggenburg gas works, at Graz (250 miles) North of Trieste), recently applied to Consul Hossfeld for addresses of American exporters of gas coal, and, referring to the alleged London test, said:

"The statement is astounding. If it be true, it would pay even in Graz to use American coal." Consul Hossfeld said:

I should be pleased to receive from our coal producers, for distribution among interested parties in my district, analyses of their coals, as well as statements of well authenticaed gas tests, where such tests have been made.

That with properly directed efforts a good market can be established here for superior grades of American gas coal, I have not the least doubt.

New German Tariff—Consul Langer writes from Solingen, that the board of trade has passed a resolution to request the tariff commission not to increase the duty on "pipe bloom rolled, but not wrought," as this is an essential raw material, imported from Sweden, and can not be manufactured in Germany. The present rate of duty is 12½ per cent and the new traiff increases it to about 15 per cent.

IOWA'S IRON MINE.

S. W. BEYER, IN ENGINEERING AND MINING JOURNAL.

IT has long been known that certain facies of the Galena-Trenton formation as developed in Iowa contains a considerable precentage of iron. Hall in his "Geology of Iowa" mentioned the deep red-brown color so often exhibited by this limestone when weathered. The ocherous pockets and seams have been mentioned by all who have written of the lead and zinc deposits of the Dubuque region. It was of more recent date that certain ferruginous deposits in the vicinity of Waukon in Allamakee county commenced to attract the attention of the commercial world. Up to 1894 a few test pits had been dug but those familar with the deposits little realized their importance believing them to be, in course of time, a possible source of mineral paint. During the year just mentiond Professor Samuel Calvin visited the field and made a thorough examination of the ore body as then known and embodied the results of his investigations in "The Geology of Allamakee County" which appeared in Volume VI. of the Iowa Geological Survey and was issued the following year. In this memoir were included the results of chemical analyses of representative samples of the ore. Owing to an unfortunate typographical error in placing the decimal point the phosphorus constituent was multiplied ten-fold, thus making that element exceed the permissible limit in ore of economic importance. This report was the first authoritative account of the district given to the general public and the misstatement in phosphorus content has been responsible in large measures for its tardy development. Prospecting and testing continued somewhat intermittently until 1899, when actual mining operations were begun. During that year 1,260 long tons of ore were produced. The two succeeding years show an increased output, the amount marketed for 1901 being 4,876 long tons. All of the ore thus far produced has been shipped to Milwaukee and used in furnace mixtures.

The principal ore body and the only one up to this time which has been developed, is known as Iron Hill and is situated about three miles Northeast of the town of Waukon, the county sea of Allamakee county. Iron Hill is the highest point in the county and forms the divide between Village Creek and the Oneota river. The summit of the ridge reaches some 200 feet above the water of the creek. The hill trends East and West. has an area of more than half a square mile and is crowned by the ore beds which extend farthest down the South slope. The lowest level ascertained, where the beds appear to be in place, is about 50 feet above Village Creek. Detached boulders and fragments of ore are encountered in prospect holes at much lower levels. The hill has been exploited thoroughly by sinking numerous test pits; and the ore body is reported to attain a maximum thickness of 135 feet. The test pit records show that the underlying limestone forms an almost level floor, slightly dipping toward Village Creek. The major portion of the ore body rests upon a Galena-Trenton base, though an inconsiderable portion appears to extend down to the Saint Peter sandstone, probably brought about through a "creep" produced by the undercutting of the creek.

The ore is concretionary, the concretions varying in size from a fraction of an inch to aggregations several feet in diameter, and are imbedded in an ocherous clay matrix. While some of the concretions contain stained clay cores, many are hollow and the beds when viewed en masse present a strikingly cavernous appearance. The caverns vary in size from one to a few inches and possess the spherioda' shapes usual to nodular structures. Irregular caverens of larger size are not uncommon. Scattered throughout the ore body are occasional chert or flint nodules, sometimes occurring singly, at other times in aggregated masses of considerable extent. In the latter the individual cherts are cemented together by hydrated oxide of iron, which often includes a liberal admixture of water-worn quartz grains, varying from sand to pebbles of half an inch in diameter. The conglomeratic boulders are more frequent at certain levels than others but appear to have no definite limits. They are often closely associated with the richest ore bodies.

Fractures and joint planes are not prominent features and when they occur may be attributed usually to the present topography and are supposedly due to creep.

Nature of the Ore—The principal ore present appears to be the hydrated sesquioxide of iron or limonite, somwhat siliceous as is shown by the analyses herewith appended.

	Sample No. 275 C. E. Patrick Analyst.	Waukon Ore J. B. Weems Analyst.	Waukon Ore Black. Fisher of Milwaukee Analyst.	Waukon Ore Yellow. Fisher of Milwa'ke' Analyst.	Waukon Ore J. B. Weems Analyst.	Average.
Metallic Iron	54.32	47.88	58.54	54.79	57.75	56.65
Silica and insoluble	....	9.08	4.00	5.12	3.26	5.38
Water	....	12.34		11.92	10.92	11.53
Phosphoric acid	0.13	0.41	....	0.13	0.72	0.32
Lime	....	....	....	0.70	....	....
Mangesia	....	....	....	Tr.	....	....
Alumina	....	6.08	....	Tr.	0.25	....
Manganese oxide	....	.90	....	Tr.	0.20	....
Sulphur	None	1.07	....	....	....	....

Aside from the limonite, the ore appears to be in part hematitic. This is shown by the analyses of certain selected samples which gave nearly 67 per cent iron. Pure limonite contains only 59.8 per cent iron while hematite may reach 70 per cent when pure. The phosphorus percentage shows considerable variability, doubtless owing in part to the method of sampling. The samples showing the largest amount were taken from single concretions and cannot be considered to fairly represent the general ore body. Analyses made for the purpose of grading the ore placed on the market show the phopshorus content well within the danger limit rarely exceeding 0.09 for pure phosphorus. Similar variations may be noted in the sulphur content. The sulphur present is doubtless in the form of the pyrite and is not often detected.

Origin of the Ore—Professor Calvin in his memoir to which reference has been made demonstrates conclusively that the ore beds cannot be accounted for through secular decay, and concentration in place, of the iron constituent contained by the rocks, but that some secondary process of concentration must be taken into account. A single argument put forward by him is sufficient to render impossible any in situ explanation. He states that a liberal estimate of the stratified rocks removed from the district would not exceed 1,000 feet, and granting the presence of one per cent of iron on the average, and no loss during the process of degradation, the maximum thickness of the ore residuum could not exceed 10 feet, an amount less than one-tenth of the actual thickness reported. His conclusion is, that the ore beds were accumulated through the well known processes of decaying organic matter and circulating water, generally known as the "bog iron ore" process. While the bog iron ore theory explains the greater portion of the deposit, the presence of the irregularly arranged siliceous concretions, the water worn quartz pebbles, render obvious the complexity of the conditions which prevail during the time of accumulation.

Mining—Some years since, the Waukon Iron Company was organized to exploit Iron Hill and if circumstances proved favorable, to mine and ship ore. The chief organizers and owners live in the county. The first serious attempt to develop the property was during the season of 1899. Early in 1901 a complete modern ore washing plant was installed and put into operation.

The beds are easily worked and as there is almost no stripping the open pit method is adopted. The usual practice is to break up the ore by the use of heavy charges of black powder. The large boulder concretions are further reduced by breaking with dynamite. The ore is loaded by hand into two-ton home-made wooden ore cars and hauled by horses to the washer. A double track leads from the pit to the washer, the grade favoring the loaded car.

The plant is conveniently located at the head of a ravine which leads down to Village Creek, and is equipped with a complete McClanahan-Stone outfit, manufactured by the McClanahan-Stone Machine Company, of Hollidaysburg, Pa. The ore from the car is dumped into a hopper which leads to a single roll crusher. The crushed ore passes directly in to a single 25-foot log washer; consisting of steel shaft

armed with steel blades rigidly bolted to the shaft. Here water is admitted at the rate of 300 gallons per minute when the plant is operated at its full capacity. The ore from the log enters a standard McClanahan-Stone double shell screen. Arrangements are made so that an additional 50 gallons of water per minute may be introduced here if desired. The srceenings fall directly into an inclined trough leading to a sluice box which carries the waste down the gully. The washed ore is caught by a steel pan conveyor which carries the ore to the storage bins. The chert nodules and other impurities are removed by hand as the ore passes over this belt. An overflow bin has been provided some distance from the plant and is connected by an elevated cable conveyor. The capacity of the plant is 300 tons per 10-hour shift. Power is supplied by a Fairbanks-Morse 120 horse-power boiler and a Frost slide-valve engine of 85 indicated horsepower. Water is obained from a well, 500 feet in depth, on the premises. A constant supply is maintained by the use of an open storage reservoir of 12,000 barrels capacity. The machinery thus far installed is throughly modern, well housed, and well kept.

Future of the Industry—Iron Hill can not take rank as an iron producer until better transportation facilities are provided. The Waukon branch of the Chicago' Milwaukee & St. Paul Railway ends some three miles distant as the crow flies, but according to recent surveys would require an actual extension of some five miles to bring the plan into connection with it. A water grade can be secured down Village Creek to the Mississippi river, but in this case a new line of railway from 15 to 18 miles in length would be required. At the present time it is difficult to say which would be the more practicable route. The concensus of opinion slightly favors Village Creek as it is the most direct to navigable water. This industry can scarcely be said to be more than initiated. The output of the past year represents the plant running at its full capacity for less than 20 days. This state of affairs was due almost wholly to bad shipping facilities. The cost of transferring the ore from the washer to the car is now 50 cents per ton, an amount greater than is paid for transporting Lake Superior ore from Duluth to Cleveland and other lake ports.

The ore would yield readily to the steam shovel which would be more independent of weather and labor difficulties. Some form of haulage would effect a saving worthy of consideration. At present two horses and two drivers are required.

It is estimated that about 30 per cent of the material as it comes from the pit, of which the larger portion is ferruginous clay, passes through the screen. With the clay a considerable percentage of fine ore also escapes. No attempt is made to recover this ore, although such recovery might be effected readily by passing the screenings through a jig. The clay itself could be caught in settling basins, and used in the manufacture of brick, thus utilizing the products of Iron Hill to their fullest extent and adding no mean sum to the profits of the business.

Ore in Sight—The visible ore body on Iron Hill has a superficial area approximating 300 acres, and a maximum thickness reported to be 135 feet. The average specific gravity of limonite as it ordinarily runs is 3.75, but owing to the cavernous character of the beds in question, 3 may be assumed as a safe factor, and if 70 per cent of the deposits is marketable, there would run about 3,000 tons per foot per acre. If the further assumption be made that the beds will average 40 feet in thickness, the tonnage would be 120,000 tons per acre or 36,000,000 tons for the entire deposit. Or to be still more conservative and assume the average thickness to be 20 feet and reduce the acreage to 200 acres, the other factors remaining the same, the available merchantable ore in sight would be 21,000,000 tons, an amount worthy of respectful consideration.

Several other ore bodies, similar in occurence and association, but much less important, are known to exist in Allamakee county, but as yet have not been thoroughly explored.

Our Trade With Great Britain—It is in Great Britain that we find in its fullest development the effect of the American commercial invasion of the world's markets. It is true that American competition has been making notable inroads into the commerce of all the countries of Europe. But important as is the effect which has been

produced upon commercial conditions in the Continental countries, that result is almost insignificant when compared with the consequence of this competition in Great Britain. From the beginning of our history England has formed our most important market, and for two generations at least we have been the largest customers for English products. In the last half-dozen years a change has taken place in the trade balance between the two nations which is perhaps, the most notable single commercial event to be recorded in the last decade. We have been steadily reducing our purchases from the mother country; we have been making astounding increases in our sales to her. Comparing, for instance, the change which has taken place in the trade movement between the two nations in the last half dozen years, we see that our annual purchases from the United Kingdom have dropped $16,000,000, standing last year at $143,000,000. In the same period our sales to Great Britain nearly doubled, going up from $37,000,000 in 1895 to $631,000,000 last year. This change in the annual trade balance, showing for us a more favorable total by $260,000, 000 than we had six years ago, is a change of such import as can only mean revolutionary transformation in the industrial life of the two nations. These figures are so significant that they need to be dwelt on somewhat, to fix in the mind their importance. Six years ago we sold to Great Britain $228,000,000 more than we bought. Last year we sold to her $488,000,000 more than our purchases. In every business day last year we sent to her $1,500,000 more than we bought. For every dollar's worth of goods we bought we sold her four dollars and forty-one cents' worth of our products.—Frank A. Vanderlip, in the March Scribner's.

French Coal Washer—The growing scarcity of coal in European countries makes it necessary to take advantage of every bushel of combustible matter coming from the mines. A recently perfected process is said to utilize the whole product. The following description of the Maurice centrifugal coal washer will doubtless be of interest to coal and coke producers of America:

The process is adapted for the treatment of coal in which slates appear so thin and so mixed with the coal that the washing was considered impossible by other mechanical processes. Nothwithstanding this difficulty, the result obtained has been very satisfactory; for, treating the slaty coal extracted from a mine near St. Etienne (carrying from 28 to 30 per cent of ash and slate), this machine obtained a washed coal containing not more than 9 per cent, as shown by the statement below.

First operation—Two thousand eight hundred and fifty-two tons, containing 30 per cent residue gave 1,550 tons containing 9 per cent residue and 1,302 tons containing 55 per cent residue.

Second operation—One thousand three hundred and two tons containing 55 per cent residue gave 525 tons containing 18 per cent residue (coal for boilers) and 777 tons slate.

A machine occupying a space of 36 square feet will wash from four to ten tons of dirty coal per hour, according to quality, and requires only about three horse-power to operate.

In ordinary cases, experiments showed that the "Maurice coal washer" will treat all kinds of coals with the least possible expense of water and assures a larger production than any other machine, space and power considered, and that it dispenses entirely with the necessity of sizing, as it can wash coal containing a great quantity of dust, after this has been passed through a screen of one inch diameter. Further, it gives no slime and there is no loss of coal in this way. It is claimed also for this apparatus which is operating in one of the large iron and steel works of Europe that it acts more freely on the iron pyrites than any known process.

A special adaption of the same process has been made for the treatment of auriferous sands.

The above report was furnished Vice Consul Burroughs, St. Etienne, by Mr. King, 23 boulevard des Italiens, Paris, who is the agent of the Maurice coal-washing machine and has recently visited the works of "Les Etablissements de l'Home et del la Buire," near St. Etienne, where the machines are made.

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Accumulated Misfortunes.

The iron and steel makers seem to be running in a rut from which there is no escape, at least for some time. For almost a year the iron and steel trades have been discouraged from one cause and another until production and shipments have become so badly tangled that relief seems to be virtually impossible. Beginning with untoward conditions last spring, followed by the strike of the steel workers during the summer, then the strike of the railroad employes, then the shortage in cars, then the shortage in motive power, now an actual serious shortage in trackage, the panorama has been long and dismal. Notwithstanding these drawbacks the trade has held a very fair front but conditions seem to be gradually breaking down the expectations of the manufacturers during the closing months of last year and the early months of 1902.

The tonnage booked for delivery this year is so far in excess of last year, or any other, that it is difficult to see how the close will not witness a greater percentage held up at the end of the year than at any other time. Unprecedented demands for rails and structural material alone would have been sufficient to add to the burden of a busy year but when the production is hampered from the blast furnaces and coke ovens on through all the finished lines there is certain to be some bitter disappointments among the more extensive consumers whose contracts must close over into 1903, unless remarkable events happen within the next three months.

The Future of Steel.

The remark made by President Schwab, of the United States Steel Corporation on his return from his European trip had a significance not granted at that time. Perhaps that was because President Schwab directed the point of his interview towards the steel makers of the European countries. In substance he said that there was no longer an enmity towards the United States Steel Corporation in the minds of the foreign steel manufacturers but that there is a strong curiosity over what the big concern might do next.

President Schwab might easily have gone one short step further and said with equal truth and candor that the steel makers of the United States have the same curiosity concerning the possible future movements of the United States Steel Corporation. He might have said that the American steel producers who are not so strongly entrenched behind ignorance of American ways and the American industrial character, and not hemmed in by racial and national prejudices, are actually more curious and much more seriously concerned over the future of the United States Steel Corporation than the most curious European.

The initiatory preparations in process of development within the United States Steel Corporation are more disturbing to the American mind that they can be to the foreigner. The outside American industries are much closer to attack with more disastrous results than the same industries of foreign countries. The independent American steel makers can not but view the narrowing of their industrial horizon though the operations of the Steel Corporation otherwise than with alarm. On both sides the extensions of operations seem to be forced as maneuvers of defense. The United States Steel Corporation cannot rest with its existing scope of operations and equipment for prompt production, or the independent producers might overtake their superiority. On the other hand the independent steel producers cannot afford to stand still and supinely depend upon the Steel Corporation for their supplies of raw steel. Some decisive development in that direction is close at hand.

Plate Mill Practice.

The advantages derived from the use of steam instead of salt for the purpose of removing scale from plates during the process of rolling are not generally known to manufacturers of steel plates. When the slab or ingot is taken from the furnace it is covered with a thick scale, which if not removed will make depressions in the finished plate. It is the common practice to have a man on one side of the rolls to shovel salt on the plate to detach the scale, and a man stationed at the other side with a long handled brush to sweep it off. The disadvantages of this process are many, the most annoying the deafening reports of the explosions of the salt. The most serious is the corrosion of the smaller parts of the machinery, due to the chemical action of

the salt and water, making frequent repairs necessary, difficult, and expensive.

The advantages from the use of steam are the elimination of the explosions. the prevention of the corrosion, making the necessity for repairs less frequent, more easily made, reducing the cost of repairs. The saving of 90 per cent of the salt: salt being used only in extreme cases. The saving of the wages of the salt man, and the difference between the wages of the brush man and the wages of a boy to operate steam.

The most important advantage is in the finish of the plate. The salt finished plate cannot be compared to the steam finished for smoothness of surface. The cost of fitting up a plate mill to use steam is very small, as it is only necessary to place a perforated pipe back of the rolls and close to the cross bar in such a way that if the plate curves up it will strike the bar instead of the perforated pipe. and with a quick opening valve placed at the side where it can be operated by a boy. The operation is very simple. When the plate comes through the rolls the boy opens the steam valve and the steam strikes the plate at the proper angle, detaches and blows the scale from the plate.

Personal.

F. H. Duehler, of the Beaver Creek Coal Company, of Somerset, Ky., was in Pittsburg during the week on his way home. He said Kentucky coal operators are to place their product in competition with Cardiff, Wales, in Mediterranean ports. Mr. Duehler has been in the East arranging for docks and shipping facilities at Savannah. Ga., and Charleston, S. C. With the present rate on the railroad, he says Kentucky operators can sell their coal in the foreign depots for a much lower price than that now quoted for Cardiff coal and make a good profit.

W. W. Root, well known in railroad circles, formerly General Western Freight Agent of the Big Four at Kansas City. took service with the S. Obermayer Company, manufacturers of facings, etc., Cincinnati last week. Mr. Root is in charge of traffic for the company. He will look after the traffic of the plants of the company at Chicago, Pittsburg and Cincinnati.

A. P. Gaines, of Bristol, Tenn., has taken charge of the Bessemer division of the Tennessee Coal, Iron & Railroad Company, John Dowling. resigned.

C. L. Thompson has been appointed assistant superintendent of the Youngstown district of the Republic Iron & Steel Company.

Ready to Improve.

The councilmanic committee of McKees Rocks and officials of the Pittsburg & Lake Erie Railroad Company, charged with the location of a site at Turner station, McKees Rocks, on which the railroad company desires to erect a large viaduct for the purpose of carrying what is now known as Jacks run road over the tracks of the company, have finally come to an agreement. The company has some 20 tracks there now, all of which are crossed at grade by the road in question. The company proposes to put down a number of new tracks, so that it will have about 40 in all. Hence the necessity of avoiding at such a place a street crossing at grade.

Jack's run road, eliminated by the proposed viaduct is to lead off from Island avenue and land on George street, on the other side of the railroad yard. The structure will be about 800 feet long and 21 feet high. This will necessitate an immense amount of filling in at the approaches to the viaduct. The latter, which will be of steel, will be erected at the expense of the railroad company. The filling in at the approaches will be done by the borough. No detailed plans for the viaduct have been drawn. but now that a site has been agreed upon, work on the plans is to be started at once. The viaduct will cost considerably over $100,000. Aside from the viaduct the company lately awarded contracts for a roundhouse and paint shop. Other buildings to be erected include a power house, carpenter shop, repair shop and a machine shop.

Severe Test For Paint.

The Joseph Dixon Crucible Company, Jersey City. N. J., gives interesting information concerning the painting of the Union railroad bridge, which crosses the Monongahela river at Pittsburg. (Rankin).

The associate engineers were Messrs. Emil Swensson, designer and engineer of construction, and William H. Smith, chief engineer, Carnegie Steel Company. The total weight of the bridge is 5,135 tons, and a total length of 2,328 feet.

Designed for carrying molten metal from the Carrie furnaces to the steel mill and raw materials to the furnaces. this structure is subjected to heat from the molten metal, sulphur fumes from locomotives and river steamers, and adjoining furnaces and steel mills. No other steel bridge in the world is exposed to so many and severe destructive agencies. The best metal preservative was necessary, and the engineers selected Dixon's Silica-Graphite Paint, manufactured by the Joseph Dixon Crucible Company.

IN AND ABOUT PITTSBURG.

The American Railway Association has hit upon a new idea in the matter of relieving the present congested condition of freight traffic on the various railroads. This developed at a meeting of the association's Car Service committee at the Hotel Schenley, at the close of last week. Heretofore it has been the custom for one railroad using a car belonging to another road to pay for the use of that car only for the miles it traveled upon the road of the company using the car. As a result, a car was often switched on a sidetrack and held for days before an effort was made to deliver it to the railroad owning the car. Now it is proposed that a railroad company having in charge a car belonging to another railroad company shall pay for the use of such car, not according to the number of miles the car has traveled, but a certain amount per day that such car is kept on the tracks of the receiving company. The results arrived at by the Schenley gathering will be submitted for approval to the next meeting of the American Railway Association, in New York, in April. The officers at the Pittsburg meeting represented 240 railroads operating 198,000 miles of road.

Plans have been preprepared by the American Sheet Steel Company for the enlargement of both the Wellsville, O., and the McKeesport works. Four mills will be added to the Wellsville plant, increasing it from a six to a ten-mill plant. The main building also is to be extended about 100 feet and the entire structure will be rebuilt of steel, but this will not interfere with the operation of the plant. Two of the present mills are to be thoroughly modernized. At McKeesport three mills are to be added, increasing the size of the plant from 13 to 16 mills. When these additions are completed Persifer F. Smith, the district manager, will have 26 mills under his jurisdiction instead of 19. The company, also contemplates the erection of a works on the site it owns at Carnegie. During the steel workers' strike last summer the company removed its plant to Vandergrift. At the Pittsburg office it was said that no information had been received from headquarters that would warrant the confirmation of the report.

Col. J. M. Guffey is to be the majority stockholder in the structural steel car company that is building an extensive plant at Canton, O. The structural steel car plant will cost upwards of three quarters of a million and will be in operation July 1. The steel casting plant will cost a half million. Col. Guffey's son, Harry, will be the manager of the car works.

The Colonial Steel Company, of Pittsburg, began operations last Thursday at its new plant at Colonia, Beaver county. Work in the puddling mill, began with 10 furnaces and a train of muck rolls. The entire plant will not be in operation before July 1 next. The output will be crucible steel, but a high grade open-hearth steel will be produced later.

Three of the buildings are completed and two more are nearly ready. All are of brick and steel construction. The machinery is all on the ground. What is not in use will be set up in a short time. The crucible smelting department will be in operation in two weeks. The hammer department is expected to be running by April 1. The rolling mill department, embracing eight sets of mills, will be in operation by July 1.

The Ellsworth Coal Company's shafts Nos. 3 and 4, near Scenery Hill, closed two months ago, started last week. The miners have since been employed at the Nos. 1 and 2 shafts, at Ellsworth, two miles below, and the output there has been increased from 200 tons per day to more than 600 tons per day.

The directors of the Champion Saw & Gas Engine Company, Beaver Falls, have increased the capital stock of the concern $10,000 and will build additions to the works, although it has not been a year since the plant was enlarged to double its former size.

The Jamison Coal & Coke Company, Greensburg, has increased its indebtedness from $775,000 to $1,525,000 and issued 750 bonds of $1,000 each purchased by the Union Trust Company of Pittsburg.

February 1 the Pennsylvania Lines' record was 10,000 cars loaned and 15,000 cars borrowed. These lines, East and West, operate 160,000 cars, and have orders placed for 20,000 to be ready for service in a few months.

Plans have been approved by Pennsylvania Lines West for the reconstruction of the Panhandle bridge across the Monongahela river, giving three feet more clearance than at present.

The Fayette Manufacturing Company, this city, has bought a tract of ground at Chester, Pa., and will build a plant to manufacture magnesite brick. The land comprises 12½ acres.

NOTES OF THE INDUSTRIES.

W. F. Bonnell, of Otis Bonnell & Company, has been appointed special commissioner for the Independent Sheet Steel Manufacturers Association to go to Europe and negotiate for foreign billets. The plan is considered a temporary make-shift until conditions improve in this country. The contracts will be for about 40,000 tons, and it is likely that they will be placed with English and German manufacturers. In case orders come for certain grades or sizes of sheets to a member of the association and his plant cannot turn them out, he will transfer the order to another member of the association who can. In this way it is hoped by the association manufacturers to hold the business of the various concerns in the association within the bounds of the associated concerns.

It is announced that the various enlargements of the Colorado Fuel & Iron Company will be completed and in operation before the close of the current calendar year. These additions will include nail, wire and tin mills, and will give the company an aggregate capacity of about 600,000 tons of finished products a year. Some, if not all, of these mills are expected to be in operation by early autumn, so that the company may begin this year to realize on its increased capacity. Another new furnace, having a maximum capacity of 500 tons a day, will be blown in next April.

Charters were granted the past week to the following Ohio concerns: Bellefontaine Bridge & Iron Company, Bellefontaine, increase of capital stock from $25,000 to $75,000; Briggs Boiler Works Company, Akron, capital $50,000; Mansfield Engineering Company, Mansfield, capital $100,000, incorporators, W. Clayton Lloyd, Henry Heer, Jr. William McE. Weldon, Maurice O. Halverstadt Thomas Hall and George A. Hall for Mansfield; Winfield E. Lloyd of Zainesville, and Arthur N. Lloyd, of Muncie, Ind.

The Caledonian Railway Company, has just obtained delivery of twenty 30 ton wagons built for it by the American Car & Foundry Company, of Philadelphia. The orders for the wagons were placed months ago, and the deliveries are beyond the specified date. They are of the bogie pattern, and will be used chiefly for the carriage of iron ore. They are the first consignment of 250 ordered by the Caledonian Company.

President Scranton, of the Lackawanna Steel Company, has just returned from Buffalo where he inspected the new properties building at Stony Point, five miles from the city limits of Buffalo. The administration building already has been completed at a cost of nearly $100,000, and nearly all the officers of the company have established themselves there. The main rolling mill will be nearly a half mile long.

The St. Louis Plate Glass Company has been formed at St. Louis and will be incorporated under the laws of Missouri, with a cash capital of $2,000,000. It has 1,200 acres of land at Valley Park, on the Meramec river, 17 miles from St. Louis, contracts have been let for buildings and machinery, and by November 1 it is expected to have the plant in operation.

The old story of a deal between the United States Steel Corporation and the Tennessee Coal & Iron Company has been revived and made the pretext for a bullish demonstration in Tennessee Coal & Iron stocks. It needs hardly to be remarked that there is no better ground for this story than there was for any one of the previous similar stories.

A coal deal aggregating $750,000, was closed February 28 at Parkersburg, W. Va., by New York and West Virignia parties. The West Virginians concerned are J. T. Carter, M. G. Zinn and Joseph Freeman, of West Union, and M. Conn, of New York. The parties optioned the Doddridge county territory some time ago, the options to expire March 1. The deal merely includes the coal rights under the various properties.

The New Pittsburg Coal Company, Columbus, O., has bought from the Ewing Coal & Salt Company 1,123 acres of coal land in Athens county, on the Hocking Valley Railroad. The consideration was $112,000. The property is undeveloped and has been under option by the purchasing company before the company's stock was bought by the Pittsburg Coal Company, of Pennsylvania.

James Meehan & Sons, an American firm, have decided to establish a plant at Monterey, Mex., for the manufacture of gas engines. The capital to be invested will be $250,000 Mexican, about $113,000 gold. Gas engines are popular in Mexico and many are in use. The firm expects to manufacture all sizes and various designs.

The largest stockholders of the Lackawanna Iron & Steel Company have issued a circular advocating a new corporation having a total authorized capital of $40,000,000 of which $20,000,000, is to acquire the present capital stock at the rate of one share of new corporation stock for one share of Lackwanna Iron & Steel Company.

The Thompson Land & Coal Company, of Lemont, Pa., chief works in Clay county, W. Va., was incorporated at Charleston, W. Va.,

February 28 by J. I. Thompson Jr., J. P. Thompson, W. B. Thompson and 16 other Thompsons from Pennsylvania, Ohio and Indiana. The capital stock is $250,000, paid in.

The Youngstown Engineering Company and the Youngstown Manufacturing Company started February 27. The former is capitalized at $50,000 and will make electric traveling cranes. The latter is incorporated for $300,000 and will manufacture, nuts, rivets and bolts.

The Globe Rolling Mill Iron & Steel Company, Cincinnati, jobbers in finished lines of iron and steel, has added a line of beams, angles and channels to its stock for local trade. The company has arranged to carry in stock 1,000 tons.

The Continental Coal Company, a West Virginia corporation, principal offices at Cleveland, has been chartered to do business in Ohio, capital $3,500,000. The company will operate in Perry, Athens, and Hocking counties.

The Cincinnati Planer Company, Cincinnati, again finds it necessary to increase facilities and is letting the contract for a new addition, a one story brick structure with basement, to be used exclusively for erecting purposes.

The Tudor Boiler Manufacturing Company, Cincinnati, will supply two 250 horse vertical water tube boilers for the new plant at Lockland, O., of the Holdenman Paper Company.

The Southern Pacific has placed an order for 75 locomotives with the Baldwin works. It has ordered also 1,800 box cars, 100 flat cars, 500 oil cars and 300 construction cars.

In the Cincinnati District.

The Cincinnati Punch & Shear Company is increasing its capacity by the addition of new machinery to its equipment. The company reports the following among recent orders and shipments: Two 126 inch shears to the Tuscora Steel Company, New Comerstown, O.; 36 inch double throat punch to the Puget Sound navy yard; improved coping machine to Granger & Company, Louisville, Ky., 42 inch throat punch to the New Zealand & Mexico Inter-Oceanic Railway Company; large geared multiple punch to the Detroit Range Boiler Works, Detroit, Mich.; 108 inch shear for the Wright Shovel Company, Anderson, Ind.; and a 10 foot pack shear for the American Sheet Iron Company, Phillipsburg, N. J.

Plans have been prepared for the Stewart Iron Works, Cincinnati, for a plant to cover 12 acres. The plans provide for a bar mill, grey iron foundry and structural iron works, but work on the buildings will not be started before summer. The Stewart brothers are operating an extensive architectural and ornamental iron works at Third and Culvert streets, and in the past three years have increased the capacity of their plant 300 per cent. They are cramped for room in their present quarters and after removal will greatly increase the capacity of the structural department as well as provide for making their own castings. The building of the bar mill will depend upon the status of the iron market during the next few months.

The Wais-King Tool Company, recently incorporated, has completed its plant at Winton Place, and is putting on the market a line of punches, shears and boring mills with improved features. The company has a plant 80 x 160 feet, two stories front and one and one-half in the rear, well lighted and ventilated and equipped with the latest improved appliances, including a traveling crane which runs the full length of the shop. The plant also contains a pattern department. The company will make a specialty of boring mills.

J. H. Day & Company. manufacturers of sifters and special machinery, have bought 100x510 feet adjoining their plant on Harrison avenue, this city, upon which they will build an iron foundry, the output to be used in the manufacture of their products. The company will abandon its present foundry upon the completion of the larger one and use the room to accommmodate its plate department, which will give added room to the machine shop.

Charters were issued the past week to the following Ohio concerns: Columbus Skein & Iron Works, Colmbus, O., capital $200,000; John R. Morgan Engineering & Construction Company, of Columbus, capital $200,000; Jackson Drop Forging Company, Cleveland, O., capital $5,000, incorporators H. A. Jackson, S. C. Barrett, W. B. McAllister, S. B. Newman, and M. A. Waterson, all of Cleveland.

The Roach & VonWyck Machine Tool Company has been organized by W. H. Roach and E. Von Wyck, of this city. The company has located at 1625 Blue Rock street, Cumminsville, (Cincinnati suburb) and will build an improved 15 inch engine lathe. Mr. Roach recently resigned as superintendent of the milling machine department of the R. K. Le Blond Machine Too Company, this city.

The Japanese government has ordered from Cincinnati machine tool manufacturers, through

Takata & Company, of New York, the machinery for the government arsenal at Maizura, Japan. The orders were placed with the Lodge & Shipley Machine Tool Company, the American Tool Works Company, the Bradford Machine Tool Company, and the J. A. Fay & Egan Company.

The Globe Rolling Mill Iron & Steel Company, this city, has bought 80 x 200 feet at Commerce and Elm streets upon which it will build a warehouse to carry in stock a line of beams, channels and angles.

The Cincinnati Screw & Tap Company reports an active demand for screws and finds occasion for complaint only in the scarcity of cold drawn basic steel bars. The company recently added ten screw machines to its equipment and will put in this month. The company is in the market for additional equipment for its screw department.

Notes of the South.

The Alabama Steel & Wire Company, of Ensley, has bought 5,000 acres of the Dirtcellar iron ore lands in Cherokee county, to build furnaces. The deal was consummated a few days ago. It is understood that the development of this plant in the way of securing raw material at first hands will aggregate two million dollars. The purchase of three thousand acres of coal land by the same concern near Bessemer has been mentioned.

The Republic Iron & Steel Company will light fires in its new furnace at Thomas, April 1, when the Northern officials of the company will be present. The new stack will make over 200 tons per day and is the most modern furnace in the South. The company will at the same time light the fires in four hundred new coke ovens. The four batteries of coke ovens at Thomas now number 1,000, being the largest single coke plant in the United States.

The new rolling mill, which will roll steel sheets, will probably be located at Ensley, which is seeking its location. Ben S. Catchings, James Dwyer and W. L. Sims, of Birmingham, are at the head of the movement for the erection of the plant.

The Southern Car & Foundry Company will erect at its plant in Anniston a malleable iron foundry at a cost of $40,000. It will furnish malleable iron for the four plants of the company in the South.

The new soil pipe factory at Gadsden, which was projected upon the removal from that place of the plant of the Central Foundry Company, will be in operation within a month.

C. E. Bueck & Company have let contracts for the erection at the Trussville furnace of a new coke plant and other accessories.

The Birmingham rolling mill of the Republic Iron & Steel Company is importing men from the North to put the plant on double turn.

The Dimmick pipe plant at North Birmingham is instituting enlargements which will double the capacity of the plant.

Notes of West Virginia.

Not a mill in the Wheeling district escaped flood damage. Some of them will be compelled to remain partially idle most of this week. The Riverside works of the National Tube Company, at Benwood, were seriously affected.

The Parsons Paper & Pulp Company, Parsons, W. Va, is about in install $300,000 worth of machinery. It is the intention to put the plant in condition for turning out 15,000 pounds of bleached paper daily.

John A. Howard of Wheeling, promoter of the electric railroad between Sistersville and New Martinsville and Middlebourne, 16 miles, expects to have work on the road started the coming summer.

Surveys for the Buckhannon & Northern railroad between Buckhannon and Fairmont, will start at once. The road has its principal office at Fairmont.

The new Huchinson-Barnes Brick Company, Fairmont, has organized: M. L. Hutchinson, president; M. N. Barnes, vice-president; T. I. Brett, general manager. Plans for the plant are being made.

Fairmont coal operators are said to be short from 500 to 600 cars daily. The demand for more cars is growing stronger hourly.

The Mannington Electric Light works, burned down last week, will be rebuilt. Twenty thousand dollars worth of new machinery was destroyed

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—If there is any difference between this week and several others just gone it is only that there is a greater tightness and a stiffening of prices all around, although it is admitted that the time for accepting or offering new business has gone by for the present. The late buyer or the buyer who has no regular source of supply, finds himself cut off absolutely from all the necessaries, but the regular buyer finds himself more at ease, although of course every consumer must conform to the conditions which are as oppressive to the producers as to the consumers. The producers are doing all that can be done to meet the most urgent demand but the ready supply of any material falls immensely short of the barest needs. It is useless to offer new business anywhere or for any material. Producers are forced to decline and devote all their energies to attempting to keep their regular customers temporarily supplied and at that are compelled to make a sort of pro rata division.

Under the circumstances it is easy enough to understand why there is such a bewildering assortment of quotations. For some materials, almost all in fact, any quotation will fit the case. Producers can get any price they might ask while consumers will pay even higher rates than producers think of demanding. Hence came the necessity of declining absolutely all new business for whatever material. The rattling around in the pig iron market last week has stopped, but if there had been enough iron to go around among the small consumers who were frantically offering ridiculous prices for material, there is no telling where the excitement would not have landed the market. As it is the lowest rate established by the little panic was about $17.00 at valley furnaces for standard Bessemer, while the minimum for the regular customers was about $16.25. Mill iron has reached the extraordinary price of $17.00, Pittsburg delivery, at which rate 1,500 tons were sold durin the week. Outside of mill iron, however, there has not been a ton of new business for the week, chiefly because the producers saw nothing but danger in holding up even the smallest lots of pig iron when the evident result would have been to force values beyond rational limits.

The production has been covered so closely up to July in all materials and up through the third quarter in many. that producers feel safe in tightening the check upon the rattled small consumers who cannot see their way out of the difficulty. The valley blast furnaces are oversold for the first half but have not contracted for the delivery of the second half's production and are not disposed to rush in so early at any price.

The producers were just beginning to congratulate themselves upon the better supply of cars for fuel, especially coke, brought about by the good weather easing up the railroad conditions when the flood came along and turned it all to wormwood. Pittsburg manufacturers state that at the rate the new cars and locomotives are coming into service and with good weather, a two months' good supply of coke will have a wonderfuly good influence, relieving much of the strain. The finishing plants will be able to get a better movement and with the raw stuffs getting prompt shipments the whole situation cannot but improve to the relief of both producers and consumers. The only change in prices on any material except those mentioned, produced by frantic buyers of pig irons, was in the advance of steel bars to $1.70, Pittsburg base, full freights to all points added. Muck bar is still quotable at $31.50 per ton, Pittsburg mill.

The rail and strucural mills are still months behind and as stated often cannot make improvement in deliveries until the coke supply helps out the raw material producers and the better supply of locomotives assists in moving the finished steel products from the mills promptly. That will not come for at least another 60 days, if then. Billets are out of the market at any price.

CURRENT QUOTATIONS:

Basic	$17 25		Splice bars	1 50	
Bessemer		17 75	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	1C 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 69	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Grey Forge, Shn	15 60		No. 1 wrought	15 50	
Bessemer billets	31 50		No. 1 cast	13 00	13 25
Open hearth	32 00		Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined.		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Standard sections.	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut.	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

PHILADELPHIA—The week has been of the general character as the one preceding. Prices have been strong and distinct advances have been made, with no indication of a reaction anywhere. Such a contingency is beyond the reach of possibility for some time to come. Mills and furnaces are sold ahead so far that a complete cessation of the demand need not affect values for a while. For delivery up to July there can hardly be said to be a regular quotation, as

prices on what little there is to be had range up to $1 per ton higher than the minimum quotations given. So far as steel is concerned there is scarcely any to be had in any form up to July 1. and beyond that date producers are quoting very conservatively. The few transactions are mainly for small lots; and there are a number of larger buyers unable to secure steel at all. There is little chance of much relief coming from abroad, as advances in the price have cut off the consideration of importing material from Germany and other foreign producing centers. Billets and sheet bars have been imported. and at prices near what the market would demand, but a growing strength in the market abroad has reduced importation.

There is little change in the condition of the local pig iron market since last report. There was comparatively little buying during the week, because there was little to buy. Furnaces are sold ahead so far that guaranteed deliveries are impossible. Buyers, therefore, are holding off until such times as business can be done with at least some degree of definiteness. Of course, there are some buyers who must have iron, but in order to get it with any degree of promptness, which is from 60 to 90 days, they are compelled to pay $1.50 to $2 beyond quotations. There is practically nothing doing in steel billets for the reason that they are so scarce, and hardly to be had at any price. The nominal quotation is about $32. The chief development in manufactured iron and steel is the pressure from some sources for an advance in structural material, but the large interests have not altered their decision. Business is growing on their books in the meantime, and some vessel as well as building operations are held up by the inability to secure deliveries. About $4 per ton premium is being paid to insure prompt shipment. Steel bars are reported to be scarce. but iron bars can be delivered almost as in ordinary times. Increased capacity for the production of plates in the past year leaves this department better able to meet requirements than most other lines. Orders, therefore, are filled with more promptness than in some other branches. It is stated that independent sheet interests are bringing out higher prices than the leading by offering prices early delivery, and in doing this are setting back deliveries on old orders. All the sheet mills report an urgent demand.

CURRENT QUOTATIONS:

Foundry, 1	$18 25	18 50	Girder rails	32 00	32 50
Foundry. 2	17 0	18 00	Angles, 3" & lr'gr		1 80
Gray Forge	16 75	18 00	Under 3-inch		1 90
Bessemer billets		32 00	T's 3" and larger		1 85
Open h'rth bil'ts	34 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

NEW YORK—Rogers, Brown & Company—The business in pig iron for the first half of 1902 is now a closed chapter in all producing districts. It is also nearly closed for the months of July, August and September. Very few furnaces, North or South, viewing their order books at the close of February, can find room for much new tonnage prior to October. For the last quarter, the best estimate is that thirty per cent of it is contracted. This refers to all the foundry, forge, basic and Bessemer pig iron that reaches the market in the United States. Under these circumstances, there is not much to say of market conditions and prospects. It is now a question of the long look ahead. Those who think the present activity is temporary, and will be checked by high prices or other causes, are not contracting. Those more hopefully inclined are placing orders for next fall and winter. It might be expected that these far forward orders would be light. On the contrary, they are heavy. Some of the largest industrial corporations have this week placed contracts running to the spring of 1903. This presumably is not for speculative purposes, but to cover contracts for machinery or other products sold, and for which raw material supply must be made secure. Price changes are not important. Some of the largest makers of foundry pig announce their purpose to make no further advances while any of their year's product remains unsold. The wisdom of this policy, taking the more distant future into account, is undoubted.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$17 50	18 00	Angles	2 00	2 50
No. 2X fdy Jersey City	16 65	17 15	Tees	2 00	2 50
No. 2 plain Jer. C.	16 15	16 65	Zees	2 00	2 50
Sohn. 1 fdy N. Y.	16 75		Time deliveries, basis $1.75 for angles, beams and channels,		
No. 2 fdy N. Y.	16 00		Com. base, bars per 100 lbs.	1 65	1 70
No. 3 fdy N. Y.	15 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	16 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

CINCINNATI—The concensus of opinion in the local metal trades is that consumers and producers of iron and steel in all of its forms are confronted by a condition which demands careful movement to prevent a repetition of the effects produced by the "boom" of 1899. Sellers

are conservative in their views of what the asking price should be and are acting on the assumption that the best interests of the trade are served by low prices. The average difference between the existing price of pig iron and the prices which obtained during 1899 is about $6.50, while the demand, in comparison with the supply, is, at present, in excess of the demand during that period. The gap between bookings and the prospective time of delivery is growing broader each week.

Leading interests are sending out reassuring reports of a supply equal to the demand for the balance of the year in order to allay any apprehensions of a famine on the part of buyers. The facts of the case, in the pig iron market as applied to Ohio and Southern furnaces, are that furnaces are producing sufficient iron to cover the needs of consumers, but owing to the lack of carriers the furnace yards are piled with the product, and consumers are shopping around for small lots to tide them over until regular deliveries can be made. During the past week the demand assumed good proportions and the aggregate tonnage booked for delivery during the last half of the year. in lots of 5,000 tons and less, was large. The majority of consumers have yet to cover for the last half of the year, though the present stimulus applies to the third and in some cases the fourth quarter of the year. The appearances are that a large order for delivery this side of July cannot be placed. The policy of railroads to prevent their cars being transferred from their own lines is causing considerable trouble. One local interest had at one time over 300 cars of pig iron put on the ground at a point near here, which lay for some time awaiting cars on a connecting line to move it.

An advance of $2 a ton on bars and light shapes was made last Friday. On lots of less than 2,000 tons of bars are differential has been made ranging from 5 cents to 25 cents per hundred pounds according to the size of the order.

The plate market continues strong but is comparatively easy as deliveries are offered in from two to four weeks. Deliveries in bars are offered in from four to six weeks. The prospects of deliveries of structural material, on the business, is to remove than to definite time can be set. There is a move on foot among several local interests to establish a bar, angle and plate mill in this district. but the matter has not taken definite shape. Stewart Brothers, of this city, have plans made for a bar mill. A heavy volume of business obtains in the market for old material and prices have advanced.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$16 25	Standard Sections	29 90	30 90
South fdy. 2	14 75	15 75	Sheet, 26	3 40	
South. fdy. 3	14 25	15 25	Sheets, 27	3 50	
South. fdy. 4	13 75	14 75	Sheets, 28	3 60	
Grey forge	13 75	14 50	Angles, 3 to 6 in	1 70	
Mottled	13 50	14 50	Angles, 1¼ to 2¾	1 82	
Shn. 1, soft	15 25	15 25	Beams and Chanls		
Shn. 2, soft	14 75	15 75	15 in and under	1 70	
L. Superior, fdy. 1	18 10	18 60	I b'ms 18, 20 24 in	1 80	
L. Superior, 2	17 60	18 85	Tees	1 75	
L. Sup'r char'l c w	21 00	22 00	Z's	1 70	
Hang'g r'k ccl, 1	22 00	22 50	1 wrought scrap	14 00	15 00
Sohn ccl c w	19 75	20 25	Steel mlting stock		
Jaksn cy. silv'y 1	18 25	18 50	gross ton	13 00	14 00
St'l brs base hlf ex	1 72		No. 1 cast	12 00	13 25
Iron bars	1 82		Old iron rails g t'n	18 00	19 00
Flange plates	1 80		Old car wheels	15 25	16 00
Tank steel	1 70		Cast borings	6 50	7 00
Ordinary fire-box	1 90		Turnings	7 00	7 75
Light rails	39 00				

CHICAGO—Makers of pig iron that is sold in this market are diligently hoarding their possible supplies, anticipating that they may become valuable as the season advances. There is accordingly a much less disposition to sell iron for future shipments than there was a month ago Spot iron is almost impossible to obtain and command a premium of about a dollar over future deliveries. It is expected that production of foundry irons in this district will increase with a normal supply of coke, but the latter does not yet appear and no one knows when the two or three furnaces now idle will start up.

For finished products the market is gradually growing stronger. It is impossible to obtain bars for the first half of the year and spot shipments are at a premium. But the greatest demand is for structural shapes. The announcement two weeks ago that large mill interests had gone out of the market stimulated such a demand that store stocks were quickly invaded and nearly everything in sight taken by needy users. It is said that already some extensive enterprises which would have been prosecuted this season, could the steel have been procured, have been deferred until next year. For plates, sheets, pipe and merchant steel, the inquiry is broadening steadily.

Old material is advancing. There is a good demand for all kinds of scrap, steel rails being especially called for. It can not be learned that there are any large stocks on hand. Some dealers, who had sold short are among the diligent buyers.

CURRENT QUOTATIONS:

Bessemer	18 00	18 50	Sheets, 26 store	3 25	3 30
Fdry Nohn 1	17 50	18 00	No. 27	3 35	3 40
Northern 2	17 00	17 50	No. 28	3 45	3 50
Northern 3	16 50	17 00	Angles	1 75	
Southern 1	16 15	16 90	Beams	1 75	
Southern 2	15 65	16 40	Tees	1 80	
Southern 3	15 15	15 90	Zees	1 75	
Forge	14 50	15 40	Channels	1 75	
Charcoal	20 00	20 50	Steel melt'g scrap	14 50	15 00
Billets, Bessemer	30 65	32 00	No. 1 r. r. wrought	17 50	18 00
Bars, iron	1 75	1 80	No. 1 cast, net ton	12 50	13 00
Bars, steel	1 65	1 75	Iron rails	22 50	23 00
Rails, standard	28 00		Car wheels	17 00	17 50
Rails, light	31 00	34 00	Cast borings	7 00	7 50
Plates, boiler	1 90	2 00	Turnings	12 00	13 00
Tank	1 75	1 80			

BIRMINGHAM—Stronger still is the Southern iron market this week. Offers for 5,000 tons of pig iron of various grades at something over recent quotations for delivery in December were made this week and declined, the furnacemen not desiring to enter into or encourage the speculative feature of the situation. The Republic Iron & Steel Company is an exemplar of the status. It has orders on books to keep furnaces going at full tilt until August and will not accept more orders, being out of the market until June 1 except for the current needs of the local foundries, etc. Last week it declined an order for 1,000 tons of No. 2 foundry at $12.50 per ton for delivery in September. The position of this company is reflected by that of others. A peculiar state of affairs is that grey forge is still bringing $12 per ton, being on a level with Nos. 2 and 3 foundry. The buyers are still running the market and there is no telling to where they will take it.

The price of soil pipe has advanced five per cent by all concerns and the advance affects the trust and independent factories in the Birmingham district.

The deal of the week was that of the Schulers, who have bought three thousand acres of coal land and five thousand acres of ore land and are projecting coke ovens, coal mines and blast furnaces, it is said, in order that the Steel & Wire Company, which operates an independent steel rod, wire and nail mill at Ensley, shall get its raw materials at first hands instead of relying on the Tennessee Coal, Iron & Railroad Company, with which it has raw material contracts at present. The Davis Creek Coal & Coke Company Company has already gone to work in the Blue Creek region and is beginning on the opening of mines and the building of coke ovens, etc.

The metal situation is thoroughly and absolutely buoyant. Even the rolling mills have commenced to decline new orders, their books being flush, and are importing operatives to get on double turn. The general status is bullish in the extreme.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 50	13 50	Tank	1 80	
No. 2 fdy, Sohn	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 50	12 00	No. 1 wrought	14 00	
Grey forge, Sohn	11 00	11 50	No. 1 cast	12 00	
Billets	27 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	310	3 50
Fire box	2 00				

The Standard Bolt & Manufacturing Company, of Alliance, O. with $100,000 capital stock, was granted a charter last week. The incorporators are: H. H. Shafer, W. R. Fogg, J. C. Devine, E. E. Scranton; G. W. Sturgeon and B. M. Haas.

Coal.

PITTSBURG—The attitude in the coal trade locally is one of waiting. The operators and miners are still standing off gazing at each other but there is no reason to doubt that when the time arrives for a settlement both sides will display a disposition to act with consideration and all the haste the occasion demands. Except for the minor problems connected in the wage scale there are no points at issue and those features need not have a slowing effect upon the opening of the lake shipping season or its movement when once begun. Local shipments remain disturbed as are all other movements of whatever character. The mills are still complaining at the inefficiency of the supply of fuel but the relief gained is insignificant.

CHICAGO—The Western bituminous coal market shows little improvement by way of supply. The Eastern products are arriving very irregularly, usually in inadequate amounts, a variety of causes contributing to the scarcity. The West Virginia roads especially are slow in getting deliveries into Chicago and to other Western points. The Ohio roads are not doing better but Pittsburg coal is reaching the West in larger quantities. It is said that the independent coal producers of the Hocking Valley roads will soon be united into one organization. Western coals are most abundant, but the market is not overburdened with coal and stocks are quite small. Screenings especially are of limited supply. Coke is very scarce and prices are firm, where they are not strong. Foundry coke receipts are considerably below those of a month ago and foundrymen are seriously inconvenienced, in some instances closing down.

CLEVELAND—The break in the ranks of the vessel men which was expeced to follow the lead of the men engaged exclusively in the ore hauling trade, and which was said to be certain to influence the coal trade, has not appeared. The shippers and vessel men are holding out with as much stiffness as formerly and if the break comes it will not be much if any in advance of the regular shipping season which is still 60 days ahead. The vesselmen are making claims that they will have much better terms than during the past two seasons but the coal companies are not letting out any secrets of their intentions.

CINCINNATI—With the three main arteries of traffic from this point to the West blockaded against coal shipments, the means of supply to Western users is cut entirely off. The local situation is somewhat easier on account of moderate weather and while stocks are low the price is kept from advancing by the heavy shipments which will arrive by river this week. Rail shipments to

this point from the Kanawha and New River fields are 25 per cent below the normal. Quotations are: Nut and slack $1.50 to $1.60; run of mine $1.85 to $1.95; lump, $2.35 to $2.45, f. o. b. cars, Cincinnati or at elevator.

Coke.

The production and shipments of coke have shown an improvement for the week notwithstanding the bad effects of the flood which forced a suspension of operations almost everywhere.

The early part of last week was discouraging, but as the week went on the railroads made gains which evened up the supply at the close. The flood then came in to stop all operations but at the earliest minute activity was resumed and the week shows gains in both production and shipments. Had the high water not interfered, the week would have placed the furnace men more at ease than they have been for months.

The gains made were secured by rushing operations, as the number of active and idle ovens in the region are the same as for the preceding week. Production, however, made a gain of 1,635 tons, while shipments as a total were 349 cars better than the week before. The shipments to Pittsburg fell off about 100 cars, but the Western movement was considerably stronger. In tons the increase in shipments over the preceding week was 4,164 tons. The Masontown field also showed some gains, 43 cars, and 1,327 tons. Should nothing further intervene it is predicted that within a month the coke operators will have placed all the blast furnaces, except at extreme points of the country, on an easy basis.

A summary of the Connellsville region for the week shows 20,459 ovens in blast and 827 idle.

The following figures show the scope of operations.

Production for the week	226,465 tons.
" last week	224,830 tons.
Increase	1,635 tons.
Shipments—	
To Pittsburg and river points	3,825 cars.
To points West of Pittsburg	5,313 cars.
To points East of Everson	2,075 cars.
Total	11,213 cars.
Last week	10,864 cars.
Shipments in tons for week	248,088 tons.
" " " last week	243,924 tons.
Increase	4,164 tons.
Masontown Field	
Shipments for week	525 cars.
" last week	482 cars.
Increase	43 cars.
Shipments in tons	13,650 tons.
" last week	12,323 tons.
Increase	1,327 tons.

The Metal Markets.

LONDON—Tin—£118 10s. £114 5s. Sales 290 tons spot; 820 tons futures.

Copper—£56 2s 6d-£55 10s. Sales, 1,600 tons spot; 2,000 tons futures.

Lead—£11 15s-£11 13s 9d.

Spelter—£18-£17 17s 6d.

NEW YORK—Tin—$25.90 $25.60.

Copper—Lake, 12⅝ 12½.; electrolytic, 12½-12⅜; casting, 12½-12¼.

Lead—$4.10.

Spelter— $4.37-$4.30

ST. LOUIS—Lead—$4.05.

Spelter—$4.15-$4.10.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including March 3, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUN
Transit	707,335	410,513
Tidewater	206,038	98,246
Southwest	54,156	270 497
Eureka	52,958	975,206
Buckeye, Macksburg oil	1,215	365,065
New York Transit	436,074	
Southern	606,795	———
Crescent	184,774	———
Total	1,101,516	2,011,492
Daily averages	75,093	72,206

LIMA.

Buckeye / Indiana Local Division	1,680,930	1,885,424
Daily average	60,088	49,479

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
February 26	$1.30	$1.15	$1.15	$0.88	$0.80	$0.80
February 27	1.30	1.15	1.15	0.88	0.80	0.80
February 28	1.30	1.15	1.15	0.88	0.80	0.80
March 1	1.30	1.15	1.15	0.88	0.80	0.80
March 3	1.30	1.15	1.15	0.88	0.80	0.80
March 4	1.30	1.15	1.15	0.88	0.80	0.80

Wire and Nails.

Wire, plain, car lots, jobbers	$2 05
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 25
Cut nails, less than car lots, retailers	2 35

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10 c
Copper, light bottoms	8 c
Heavy Composition	9 to 10½ c
Brass Turnings	6½
Heavy Brass	7 to 7½ c
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	$3.00
No. 1 Pewter	16

Electric Machine Sales.

Recent orders for the engine type generators of the Crocker-Wheeler Company, Ampere, N. J., give further evidence of the regard in which the machines are held by manufacturers all over the country. The company has brought these generators to such standards as shall give a wide range of outputs and still maintain speeds that correspond to those chosen by the most prominent engine builders. Among others the following companies have recently placed orders for these machines.

Pittsburg Reduction Company, New Kensington, Pa: 1 size 224—200 k. w.; National Mining Company, Sygan, Pa., 2 size 224—200 k. w.; Lake Shore & Michigan Southern Railroad, Colliwood Shops, size 336—400 k. w.; Federal Lead Company, Alton, Ill. 2 size 224—150 k. w.; Farrand Organ Company, Detroit, Mich. 1 size 111—100 k. w.; Snelleberg & Company, Philadeplhia, size 224—200 k. w.: 1 size 111—100 k. w.: Harrisburg Pipe & Pipe Bending Company, Harrisburg, Pa. 1 size 224—200 k. w.; American Bridge Company, New York. 1 size 280—300 k.w.; Allis-Chalmers Company, Milwaukee, Wis. 1 size 336 300 k. w. Hawley & Hoops. New York. 1 size 84 75 k. w.; Hall of Records, New York, 2 size 225—150 k. w.; 1 size 224—100 k. w.;1 size 67—50 k. w.

Wisconsin Graphite Products.

Wisconsin Graphite Paint has been acknowledged to be the best for purposes for which a paint of this nature is used. It has a bright lustre and even surface, and will outlive ordinary preparations. It practically incorporates itself into the iron and steel wherever applied. The Wisconsin Graphite Company's preparation, Wisconsin Graphite Stack Paint, will wear for years and is largely used by manufacturers and mill owners generally throughout the country.

This company also manufactures the well known Wisconsin Flake Graphite Lubricant, which obviates all friction, is without grit and absolutely smooth.

Wisconsin Lubricant is especially adapted for powerful engines, dynamos and machinery and the best results have justified the company's statement that Wisconsin Graphite Lubricant will convert every flywheel, every motor, every shaft, into a money making machine. Free samples on request.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.

St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50

Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

Industrial Notes.

The Sterling Foundry Company, of Cincinnati, has been incorporated with $50,000 capital stock by J. F. Zeller, J. G. Zeller, G. J. Hunleman Albert Mie and Louis Livy, also of that city. The company has secured the building on West Fifth street formerly occupied by the Queen City Foundry Company, which it will use in connection with the adoining building, which will be abandoned by the Louis Lipp Company, upon the completion of its new plant at Winton Place, O. The company will operate a jobbing foundry and will make a specialty of machine castings.

A company of Cincinnati men is being organized to build and operate a structural iron works on West second street, West of Elm street. Robert E. Sweeney is at the head of the company and intends to go East this week to purchase machinery.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots; lot of 100 pounds, $1.10 per lb.: special price on large lots.

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight........................	$4 50
Bessemer Steel, 100 lbs........................	4 40
Bessemer Steel, 95 lbs........................	4 35
Bessemer Steel, 90 lbs........................	4 30
American Charcoal Terne—I. C., 14x20 ordinary......	4 50
I. C., ordinary........................	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight, 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4.75.

New Steel Freight House.

Bids were received February 28 by Thomas Rodd, chief engineer, and Robert Trimble, principal assistant, of the Pennsylvania Lines West of Pittsburg, for a new steel freight warehouse at New Grant street and the Panhandle railroad. The structure will be fireproof and cost $150,000. It is the desire of the railroad company that work be started on the building in a few days and that it be rushed to completion within the next four or five months.

The American Bridge Company, through its Pittsburg department; the Illinois Steel Company, through W. J. Pratt, who visited Pittsburg for the purpose, and the McClintic-Marshall Construction Company submitted estimates. The building will be 150 feet wide, 350 feet long, and will occupy the site of the present old Panhandle shed. Plans have been in preparation for many months and every detail to secure the greatest efficiency in the smallest space has been carefully planned.

A scarcity in structural steel may delay the work. It was said that the reason for the Illinois Steel Company submitting a bid in competition with the American Bridge Company, was that the Illinois company has sufficient steel made that can be adapted and would permit a saving of considerable time in the construction. The mills are so filled with orders for months ahead that it will require more than diplomacy to keep construction work from delays. The Pennsylvania lines need the new warehouse badly, and every effort will be made to rush the structure in an unusually short time.

Controls the Trade.

The Chicago Pneumatic Tool Company concluded a deal last week by which it will add three large factories to its properties, and place itself in control of all of the important pneumatic tool works of the country.

In addition the deal will require the increase of the capital of the concern by $3,000,000, of which $2,500,000 will be in preferred stock and $500,000 will be in bonds. It will secure all of the most valuable patents held by the individual companies making pneumatic tools, and will be the most influential concern of its nature in the country.

The Chicago Pneumatic Tool Company until last week controlled the Boyer Machine Company of Detroit, the Franklin Air Compressor Company, of Franklin, Pa., the Philadelphia works at Olney, the Chisholm & Moore Manufacturing Company, of Cleveland, and the Taite-Howard factory of London, England.

The first board of directors included Charles M. Schwab, William B. Dickson, John R. McGinley and Max Pam, all of Pittsburg.

The other directors are J. W. Duntley, W. C. Duntley, of Chicago, the former being the president of the corporation; Joseph Boyer, of Detroit; E. Y. Moore, of Cleveland; James H. Eckles, of Chicago; John A. Lynch, of Chicago; John C. Taite and Charles P. Whitcomb, of London, England.

Pneumatic Hammer.

Melvin A. Yeakley, of Cleveland, has patented the invention of a pneumatic hammer, the ram of which is moved in one direction by air pressure supplied from a pump and retracted by the exhaust from the same pump, the operation being controlled by a valve that could be operated either by hand or foot. Another patent recently been granted to Mr. Yeakley is an improvement in this construction, which has been bought by Williams, White & Company, of Moline, Illinois. The body frame is provided with separate chambers, one supplied with compressed air, a vacuum being maintained in the other by a pump. The chambers lead to a common valve chamber from which a conduit or passageway extends to the hammer cylinder. In the valve chamber is located a rotary valve, arranged to alternately open communication between the hammer cylinder and the compressed air chamber or the vacuum chamber. This valve is operated by hand and foot levels and by the hammer, connections being made herewith.

A New Alloy.

Jacob S. Wolf, and Louis K. Englert, of West Catasauqua, Pa., have discovered an alloy of composite metal resulting from the admixture of copper, tin, iron, and salt.

The object of the invention is to produce a metal which may be used for all general purposes —such as for the manufacture of shear and blunt tools, armor-plate, bridge structure, any place where a strong, tough, durable material is desired, which will not corrode.

The composition consists, by weight, of copper, 85 parts; tin, 4 parts; iron, 6 parts; salt, 5 parts. Copper thus alloyed will be found to possess the desired toughness, strength, and durabilty to enable it to be used in most all of the parts where steel and iron has heretofore been employed and will at the same time be rustproof, enhancing its value for outdoor use or for use in damp places or localities.

A $250,000 cement plant, using natural stone will be built at Livingston, Ala.

N. & G. Taylor Removal.

The N. &. G. Taylor Company announces the removal of its general offices to the Marine and Merchant building, Chestnut and Third streets, Philadelphia. The change is necessary for its growing business in the enlargement and development of its tin plant; for its trade in open hearth, soft steel sheets for stamping purposes, and for its business in plate, iron and steel, from its works at Cumberland, Md. Its minor offices are transferred to its tinplate works at Tasker and Swanson streets, where it has also erected spacious warehouses for the proper handling of goods. Its tin plate departments have also been enlarged, and a new smelting works to meet the increased demand for its fine makes of solder, Babbitt metal, etc., has been built.

This house was established in 1810 in the old district of Kensington; subsequently it removed to Second street above Race, then to Third street above Race when in 1845 it built the premises on Branch street, which it is now vacating. It has had a continuous existence as a firm for ninety-two years being the oldest firm in its line in the United States. It is the sole manufacturer of the celebrated "Taylor Old Style" brand of hand-dipped roofing tin. This old fashioned tin is made the same as the first roofing tin that was ever made, in 1830, in Philadelphia, and sold by it at that time. The "Taylor Old Style" brand covers most of the prominent buildings throughout the United States, and is held by architects and the trade as the standard of the highest quality.

It received medals for tin plates at the Franklin Institute Exposition in 1874, at the Centennial Exposition in 1876 and at the National Export Exposition, in Philadelphia, in 1899.

New Forge Flue.

The Canedy Otto Manufacturing Company, of Illinois, has obtained control of a patent recently issued to William E. Canedy, of Chicago Heights, on a chimney for blacksmiths' forges. The object is to produce a draft flue with movable funnel or intake which can be moved to present its mouth nearer to or farther from the forge fire and thus permit the application of different forms of work to the fire, at the same time presenting the intake as close as possible to the fire to draw in as much of the smoke and gases of combustion as possible.

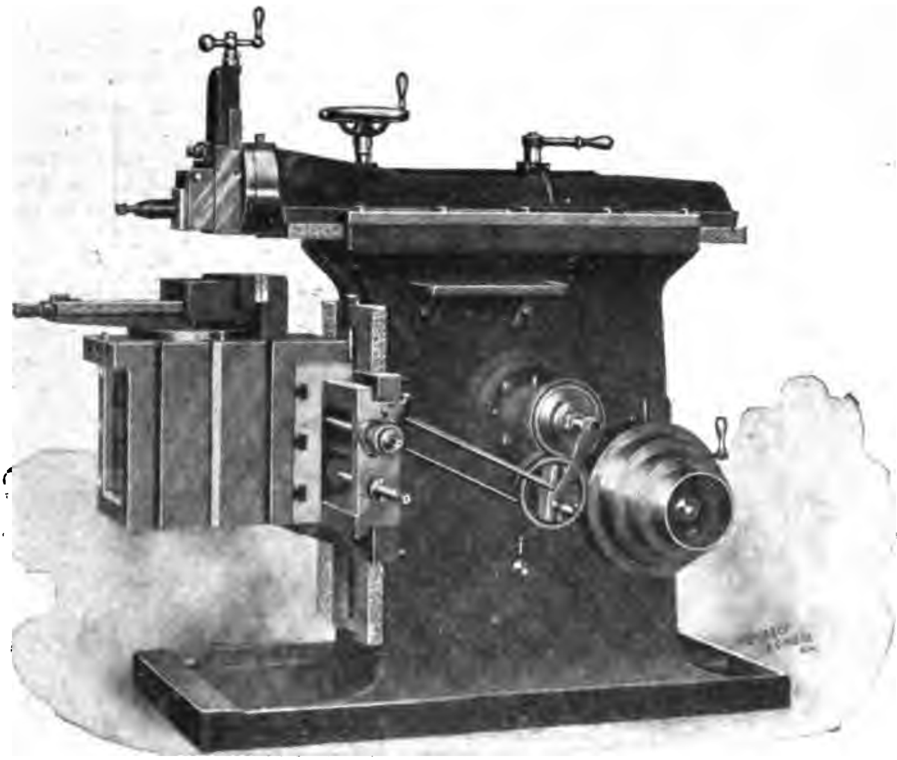
The ordinary shield is employed connected to the forge frame or hearth by brace rods. To the upper end of the shield is attached a rigid draft pipe, that may connect in any suitable manner with a chimney or flue. Pivoted in the lower portion of the pipe is a movable funnel with its lower end flaring and movable over the fire. This funnel forms a practical continuation of the upper pipe and is the only inlet by which smoke and gas can enter. It is arranged to be moved by a rock-shaft journaled upon the braces described with an offset loop or crank that bears against the rear side of the funnel, and a handle and locking means for holding it against movement.

Furnace operators of the valleys who have been informed of the proposed action to be taken by the International Association of Blast Furnace employes to demand an 8-hour day without any reduction in the present scale of wages, assert they are not considering the matter. No action will be taken until May 1 and when the proposition is presented they will be prepared to discuss it.

Look Around and See the

CINCINNATI SHAPERS

that have been placed in the Pittsburg district within the past year, examine them critically, and ask our agents for further particulars.



Twenty Inch "Cincinnati" Back Geared Crank Shaper.

BROWN & ZORTMAN MACHINERY COMPANY,

Exclusive Selling Agents in Western Pennsylvania, Eastern Ohio, West Virginia for the following Manufacturers:

THE LODGE & SHIPLEY MACHINE TOOL CO., CINCINNATI MACHINE TOOL CO., CINCINNATI MILLING MACHINE CO., CINCINNATI SHAPER CO.,

BICKFORD DRILL AND TOOL CO., THE CINCINNATI PUNCH AND SHEAR CO.,

Manufacturers of Lathes, Upright Drills, Milling Machines, Cutter and Reamer Grinders, Crank, Geared and Traveling Head Shapers, Radial and Multiple Drills, Punches, Shears, Rolls and Special Machinery.

Write for Catalogues.

Corner of Wood and Water Streets, PITTSBURG, PA.

Patents.

The following patents granted February 25, 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Grate with tubular bars, Franz Burger, Fort Wayne, Ind.: fuel feeding mechanism for furnaces, Franz Burger and H. M. Williams, Fort Wayne, Ind.; boiler, H. F. Hodges, Philadelphia; grate for boiler furnaces, Robert Mitchell, Cincinnati; rope hoist, D. M. Morgan, Cleveland; water tube boiler, William Wingerter, Hale, O.; crude oil furnace, G. E. Witt, Fresno, Cal.; pneumatic hammer, M. A. Yeakley, Cleveland; turbine engine, H. H. Boyce, Chicago; automatic smoke preventer, R. W. Cavenaugh, St. Paul, Minn.: rotary engine, J. F. Cooley, Boston; steam trap, R. J. Flinn, Boston; mining elevator, H. W. Davis, Auburn, Cal; rod coiling apparatus, W. D. DeLamarter, and F. W. Wallace, Plainfield, N. J.; apparatus for winding wire from one reel to another while same is being polished, Adolphe Guimond, Fall River, Mass.; explosive engine, Warren, Sumner, and Charles Hubbard, Sandyhill, N. Y.; billet heating furnace, C. H. Morgan, Worcester, Mass., assignor to the Morgan Construction Company, same place; rolling mill, Z. W. Onions, Wainfelin, England: pulley covering, R. H. Willis, Chicago; car haul, A. M. Acklin, Pittsburg; multitubular boiler, F. D. Althouse, New York; annealing furnace, Frederick Danner, Tarentum, Pa.; variable cut-off for engines, A. D. Gillett, Lake City, Minn; conveyor system for loading freight cars, E. W. McKenna, Chicago; reciprocating engine, C. C. Protheroe, New York; piston and piston rod, A. F. Ritchie, Duluth, Minn; explosive engine, A. W. Clayden, Exeter, England; rotary engine, E. R. Hyde, Bridgeport, Conn.: zinc furnace, G. G. Convers and A. B. De Saulles, South Bethlehem, Pa.; process of and apparatus for manufacturing white lead, F. J. Corbett, Prahran, Victoria, Australia (2); smoke preventing and fuel saving device, George Gregory, London; igniter, G. B. and E. W. Petter, London, England; spark arrestor, W. P. Allen, Albuquerque, N. M.; alloy, J. S. Wolfe and L. K. Englert, West Catasauqua, Pa.; boiler furnace, S. T. Bleyer, Chicago; igniter, Franz Burger, Fort Wayne, Ind.; rotary engine, T. J. Masters, Cardiff, England; mold for casting, J. J. Carroll, Cleveland, assignor to the National Malleable Casting, Company, same place.

The Mason Heater Company, of Bellaire, O., capital $100,000, was incorporated at Dover, Del., a few days ago.

An application for a charter has been made by the Kentucky Iron Roofing & Corrugating Company, Covington, Ky., with $25,000 capital stock. The incorporators are: John C. Droege, of the Licking Rolling Mill Company, Fred Macke, and J. H. Mersman, all of Covington. The company has began the construction of a building, 175 x 58 feet with a 95 foot wing, at Twelfth and Prospect streets, Covington, which will be completed by April 1. The product will be corrugated and galvanized iron sheets for roofing and siding. The stock will be secured from the Licking rolling mill.

WATER PURIFYING SYSTEMS FOR STEAM PLANTS.

THE porblem of obtaining an efficient supply of good feed water for boilers has come to occupy a larger share of the attention of those interested in maintaining the quality of their boilers and at no point is the question so absorbing as in the Pittsburg district. The sources of water supply in and about Pittsburg are probably the worst to be found anywhere, taken as a whole. All the rivers and tributary small streams are polluted with every form of impurity, organic and otherwise, and boilers of every description are annually destroyed by the hundreds. The trouble is worse at particular seasons, for instance, during a dry summer when the water in the streams is at the minimum and the impurities, especially that discharged by the drainge from coal mines. etc., at the maximum, but the character of the supply of water is bad at all times. Singularly, other sections of the country have taken up the question of pure feed water supply far in advance of the Pittsburg users of boilers and singularly again, the United States are, and have been, much behind Europe, and England especially, in securing pure water for feeding boilers. Our steam users have been driven to the use of all sorts of nostrums and chemical compounds which only promote the bad effects of deleterious water and acids upon the boilers.

The Hartford Steam Boiler Inspection & Insurance Company reports that of 57,312 boilers inspected internally and externally by them during a single year, 25,346 were incrusted with deposits of scale and sediment, and 1,198 in a dangerous condition from that cause. The saving of fuel, while important, is of minor consideration when the question of safety and damage which might be done by corroded and weakened boilers is considered. Tables have been prepared showing the losses due to scale, but these vary with the kind and composition of scale, so that they are of little value; but a boiler containing a coating of 1-16 inch of scale requires from 9 to 15 per cent more fuel than one which is clean, the difference depending on the nature of the scale.

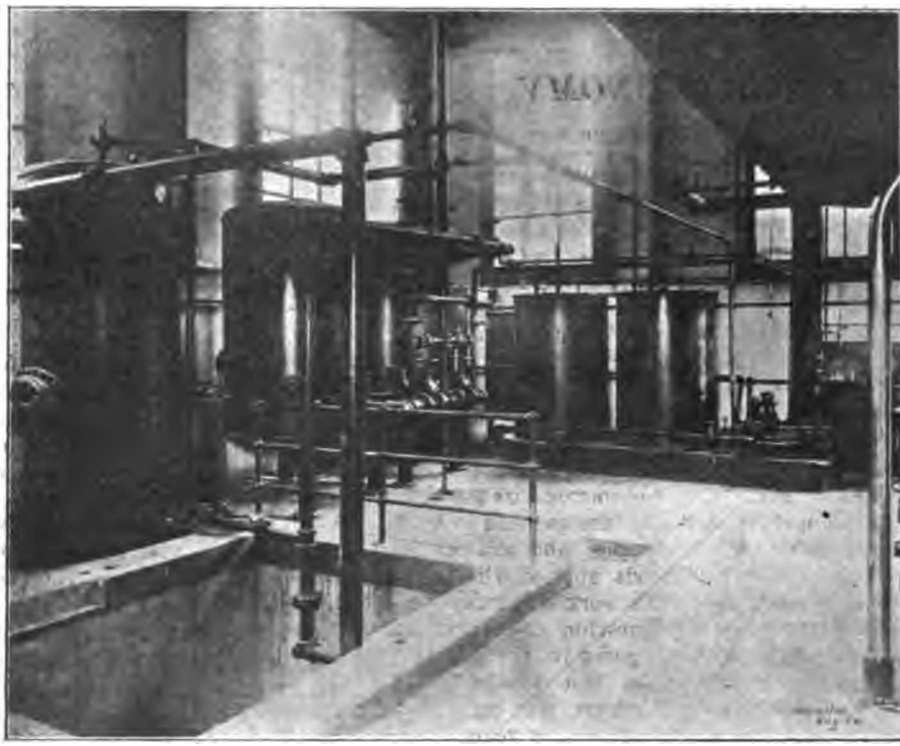
Boiler compounds act inside of the boiler, and, no matter how carefully introduced, the constant inflow of any chemical powerful enough to attack the scale and neutralize the acids will also attack the material of which the boiler is constructed. The results of the action will produce precipitation of the substances in solution in the water. These remain there, and there is an even chance of their doing as much harm, especially if they contain organic substances as the impurities originally in the water. Boiler compounds, as a rule, are thrown into boilers without regard to the contents of the water used, or the effect on the iron. So long as the scale is removed and the boiler will make steam nothing else seems to be required; but when the boiler shell is weakened by corrosion, producing explosions, it is easy to see that there is something radically wrong. Boiler foaming is often brought on by the water itself, but more often by the introduction of some boiler "cure all" which keeps the scale-producing elements in solution, causing foaming or priming, the evils of which are only too well known to engineers. Steam users who have to contend with free acids, such as sulphuric acid, are dealing with a more serious problem just beginning to receive attention after having destroyed boiler after boiler, and may have been the cause of an indefinite number of explosions. The acid, coupled with the scale in the boiler, produces a combination which must be taken care of in a careful and scientific manner.

There are but three methods of doing this. The first, whose only virtue lies in the fact that it is the oldest, viz: picking and scraping the scaled surfaces of the boiler. This is expensive, laborious and ineffectual, and has been in use too long to need further discussion as to its effects. The second plan, the use of boiler compounds, has been tried and rejected by our best engineers. If effective it is injurious, and in many cases positively dangerous. The third method, the only one that can pass muster, has been tried for years with good results, consists in the use of pure water. This method received the following endorsement of the American Railway Master Mechanic Association, after careful consideration of the various methods of getting rid of the boiler scale and preventing boilers from being eaten up by acids.

"The introduction into a boiler of any so-called remedies, be they batteries, powders, fluids, or any other nostrums, can hold no comparison whatever to this one perfect and only reliable remedy, supplying the boiler with pure feed water."

One of the most succesesful plants for supplying pure water to boilers is one in which scale forming substances and boiler corroding, acids, etc., are removed by precipitating them through the action of carefully determined chemicals, acting on the water between the feed-water heater and the boiler. Such a plant was installed for A. M. Byers & Company, this city, of which we give the following description.

The plant uses the Monongahela river water, probably one of the worst waters used anywhere for boiler-feed purposes, which contains free sulphuric acid aside from being heavily impregnated with foreign matter held in solution, such as lime, magnesia, sulphur, iron, silica, etc., in addition to mud and sand held in suspension. Some of these solutions react chemically in the boiler, while others are thrown out by the heat from boiler-destroying and scaling substances. Thus, where the scale does not form on the boiler shell, it is attacked by the acids. Even when the scale has previously formed, the acid eats into it, and acts directly on the shell, without the diluting effect of the water, thereby doing its work quicker and with more damaging results. The accompanying cut will show the manner in which the Monongahela river water is treated.



Water Purifying Plant at the A. M. Byers & Co. Mills, Erected and Installed by William B. Scaife & Sons Co.

The water as it comes from the river is heated in the feed water heater to a temperature of from 175 to 200 degrees. From the heater the boiler-feed pumps force it into a large tank, the precipitating tank, where the chemicals from the solution tanks act on the water, precipitating the free acids and scale forming substances. The water passes through an outlet near the top of the precipitating tank to the filters where it undergoes a system of double filtration through two filters which remove all the products of chemical action, in addition to any suspended matter still contained in the water.

The filters are arranged in pairs, thus avoiding any closing down while washing or cleansing the filter beds. Water so handled goes to the boilers pure, so far as boiler corroding and scaling substances are concerned.

The attention such a plant requires is trifling, as it consists of few parts, easily operated. A fixed solution is made every 12 hours in each solution tank which runs the plant the 12 hours following. The filters are washed about once in 24 hours; an interval, however, which depends on varying conditions. The advantages of such a system are apparent: no deterioration of the boilers, dispensing with the necessity of an idle boiler and most important of all, steam is generated for every pound of coal burned.

The treating of hot feed water has the advantage of making the action instantaneous, making unnecessary the large and expensive settling tanks, aside from not taking up valuable floor space. The quantity of the chemicals is reduced to a minimum, owing to the fact that chemicals act quicker and more thoroughly upon hot than cold water.

This method of chemical treatment and thorough filtration is obviously well adapted for almost every kind of impure water supplies. Any desired quantity of soft, clear and pure water which will not scale or corrode the boilers is secured at trifling cost. The primary factor in boiler explosions is removed and, aside from largely increasing the durabilty of the boilers, they can be depended upon to constantly maintain their maximum efficiency.

FOUNDRY ECONOMY.

BY DR. RICHARD MOLDENKE, NEW YORK.

THE rapidity with which the buying of pig iron, on chemical specification, has spread among the foundries of this country, is perhaps the best evidence of the value of a rational method of procedure. Where at first the broker declined to sell iron under this arrangement, or exacted an extra 50 cents per ton, one furnace even thinking a guaranteed analysis worth two dollars a ton above the market price, today the makers of foundry pig iron are almost altogether relieved from the annoying "Fracture Correspondence." That this revolution in practice has been no easy thing to accomplish, may readily be imagined, and even today the majority of founders feel a little shy of irons with the proper composition which do not show the accustomed fracture.

With the selling prices of casting finding lower levels at every period of depression, the founder naturally asks himself: "How will I keep my margin of profit unchanged? I have been as economical as possible in every way, and yet other founders, whose tonnage is no larger, are quoting lower figures and seem to be making money." The solution is not so simple, and will be found based on a good cost system in the office and scientific methods applied where needed in the shop. Just how the foundryman is to go about this work will form the substance of this paper.

Were it simply the question of employing an expert, the foundry doing a large business would soon be going in the right direction; but experts who have been through the changes of the last decade, and know what is wanted, are scarce. Technical graduates and others who carry out the scientific manipulations required in a laboratory must be given a few years to acquire practical foundry experiences before they become valuable. The owner of a small foundry, therefore, finds it difficult to take advantage of those economies which great institutions have developed after years of pioneer work in their respective lines. The founder must do a little studying himself, of cause and effect in his foundry.

He must so systematize his operations that should he not have a metallurgist on his staff, he need call in one only on occasion of troubles which require quick adjustment.

The most important consideration is naturally the daily product. This must be kept up to standard, and at the same time be as low in cost as possible. Here is where the cost accounts come in. One must know the cost per pound of the good

castings sold for every department in the establishment. Thus if the cost of core making runs say, 25 cents per pound in one month, and it creeps up gradually to 35 cents in the course of the next three, it is time to see if the knife cannot be applied effectively, or failing this, to re-arrange or place new machinery to get the work out better to advantage. On the whole it will pay to do the latter anyhow, for until the monthly figures are not brought down to a point where there will be only a fluctuation of a few points, the department cannot be said to be in proper working order. Be it understood that this refers to a fairly uniform run of work. The principle involved, however, is a truly scientific one and should be applied in every manufacturing establishment.

The molding machine question will be found the most important one so far as the foundry pay-roll is concerned. A well-managed pattern shop and pattern storage system are also money savers. If the founder is personally systematic in his work, he will not tolerate slip-shod habits in his employes; if he is not inclined tnat way, it were better for him to get an associate who is systematic. Then should come the estoblishment of systems of working marked by extreme simplicity and carried through with an iron hand, the head of the establishment setting the example.

The iron itself will naturally give the founder food for continuous thought, as it is a constantly changing factor. To effect the greatest saving in the cupola room, one must know what is there, what to buy, and how the material is handled. Take first the pig irons. They will either be piled up by car loads or stacked together by brands and with grade numbers. Thus we will see a separate pile for Low Moor No. 2 soft, Sloss No. 2; plain, Isabella No. 1X, Pioneer No. 4, and the Softeners.

Today the progressive foundry also has a number of piles. They are still separated by brands as formerly, this serving the purpose of locating any undesirable qualities shown by castings of an otherwise satisfactory composition. This statement requires further explanation. It is well known in the foundry trade that some irons are stronger than others, even where an analysis shows them to be of an identical chemical composition. This difference is most notable in irons of the lower silicon ranges, and in the case of charcoal and coke irons of the same cross-section. Among the charcoal irons we find that a cold blast metal is stronger than one made with warm blast, even if the former has more impurities. I have always contended that this lay in the manner of running the blast furnace, in so far as it affects the oxidation of the resulting pig iron. A furnace which charges pure stock and runs normal should make strong iron. The forcing of the operation, however, coupled with the addition of quantites of mill cinder and salamanders of burnt iron which can have no chance for proper reduction before they are melted and in the bottom, can only yield an inferior product for remelting in the foundry, no matter how valuable it may be in the making of open hearth steel.

Since we are not able to trace the degree of oxidation of an iron by chemical means with any certainty, it must be looked for in another way. The American Foundrymen's Association, which, through its active members has done so much to bring about the adoption of rational methods of buying and using foundry iron, will, it is hoped, in the near future develop the best methods of judging strong and weak pig irons of given compositions, so that the founder may prove to his own satisfaction whether he is getting the proper returns for his money.

As was stated above—by keeping the brands of iron distinct, inferior varieties are soon located by cutting out the suspected ones from the mixture, and noting results.

The piles are now arranged according to their silicon contents, due regard being paid to the other constituents as a matter of course. Thus, in the jobbing foundry, with sulphur and phosphorus normal in a given line of shipments, there would be one pile 1.75 per cent silicon, one for 2.00 per cent, another for 2.25 per cent, and finally one for 2.50 per cent, or four piles. If there were three brands kept in stock in all the varieties, the number of piles would be twelve. If experience indicated poor results with the low silicon ranges of any particular iron, these would be omitted in making the next contract. For light work there would be extra piles for 2.75 per cent, 3.00 per cent, and even 3.25 per cent silicon, and special piles also for high

phosphorus metals. Occasional bargains in high sulphur pig irons suitable for floor plates would also come in for this method of piling.

A letter of the alphabet painted conspicuously on each pile, and a stock book for continuous record will give the foundry superintendent the information wanted at a glance when making out his requisitions. This also conceals the identity of the iron so far as unauthorized persons are concerned, all the more so if the letters are changed about as the piles run out.

The ferro-silicons and silico-spiegels being only used in small quantities, and that only in emergencies, usually find a convenient resting place a little out of the way of the stock irons.

The scrap heap will form the next consideration. Two general classes must be reckoned with. That which we make and that which we buy or take in exchange for good castings. As will be shown later, it is necessary for the founder to know almost daily how his product is coming out, in order that he may keep his mixtures in proper shape. This information, consisting practically only of the silicon and occasionally the sulphur in the castings made, also answers for the domestic scrap. It is also possible to keep the low phosphorus scrap for low phosphorus mixtures.

With the bought, or as we call it, "foreign" scrap, things are a little different. As it is manifestly impossible to attempt a reliable sampling of this material in order to find out what it contains we must do a little guessing on this point and then use no more than the mixture can safely stand without upsetting our calculations. Fortunately certain lines of castings require irons of a pretty general by understood composition. A piece of stove plate scrap whether of recent date or made 50 years ago may be safely counted on as containing 2.75 per cent silicon, and 1.00 per cent phorhorus. Ordinary machinery scrap is never far from 2.00 per cent silicon with phosphorus and sulphur normal. Heavy machinery may be classed as 1.75 per cent silicon and if it should contain more, so much the better. Scrap rolls, plates, car wheels, malleable scrap; in fact everything out of the ordinary line of foundry work should not be used in quantity unless an expert is at hand to see that it is properly cared for in the mixture.

The founder, then, who wishes to make up his mixtures from day to day by more accurate methods than the cut and dry, will first settle upon the proportion of pig iron and scrap the necessities of the case compel him to use. He must take care of his own scrap in the first instance, and then look over the market prices of pig iron and scrap for the rest of his mixture; always remembering that the class of work he makes must not be injured by too great a cheapening of his melt. Cases may occur in which no foreign scrap is admissable at all, and you own, and a lot of steel in addition will only just let you out on the specifications. Unless you are running a sash weight factory, 60 per cent of scrap, your own included, is about all you can safely stand; and 25 to 40 per cent is a good average. It was my misfortune, through delays in shipment, to be left without any pig iron, of the kinds I could use, in the yard for the period of four days, and 50 tons of casting had to be delivered daily under contract. A mixture consisting of 97 per cent scrap, most of it foreign, and 3 per cent silico-spiegel, containing 24 per cent manangnese and 18 per cent silicon, answered all other requirements of the case, and nearly cleaned out the scrap pile. This is quoted not as an example to follow, but merely to show that a little science was a handy thing around the foundry just then.

For the purposes of the mixture calculation, suppose you prefer 70 per cent of pig iron, 15 per cent of your own scrap, and 15 per cent of foreign scrap. The size of the charge which experience has shown to be the most economical with your cupola is 5,000 pounds. You may use five charges one day and seven another. Of this 5,000 pounds, 3,500 will be pig iron 750 your own scrap, and 750 pounds foreign scrap. Experience has further taught you that the class of castings you make should average 2.10 per cent in silicon. This means 2.35 in the mixture, as about 0.25 per cent is burned out. Your scrap running 2.10 per cent silicon, and the foreign 2.00 per cent, we have the following:

Domestic scrap—750 pounds—Silicon 2.10 per cent gives total silicon 15.7 pounds; foreign scrap—750 pounds, silicon 2.00 per cent gives total silicon 15.0 pounds.

Or 30.7 pounds of silicon of the 5,000 times 2.35 per cent, or 117.5 pounds silicon wanted in the charge. This leaves 86.8 pounds to be furnished by the 3,500 pounds of the pig iron to be used. Now, in buying pig iron, it is always best to get the stock so proportioned that the greatest quantity on hand is that used to counterbalance the scrap put in. In the case under discussion, which is really that of the ordinary jobbing foundry, irons running 2.50 per cent in silicon are the ones required in greatest quantity, only smaller stocks of 2.00 per cent, 2.25 per cent, and 2.75 per cent being necessary. Let us therefore take 2,000 pounds of say "Sloss" with 2.50 per cent silicon. This means 50 pounds of the 86.8 accounted for. One thousand five hundred pounds must now furnish the remaining 36.8 pounds silicon or the iron would have to run 2.40 per cent silicon. As we do not have this in the yard, we can either reduce the Sloss a little and make up with iron running 2.75 per cent from the stock, or we may split up the remaining 1,500 pounds, into 1,000 pounds at 2.75 per cent, and 500 lbs. at 2.25 per cent silicon from the yard. Doing the latter, as it gives us three brands of iron in the mixture instead of two, we have:

Domestic scrap—750 at 2.10 per cent, give 15.7 lbs., silicon; foreign scrap—750 lbs., at 2.00 per cent silicon, give 15.0 lbs, silicon; Sloss—2,000 lbs. at 2.50 per cent silicon, gives 50.0 silicon; Low Moor—1,000 lbs. at 2.75 per cent silicon, gives 27.5 lbs. silicon: Mabel—500 lbs. at 2.25 per cent silicon gives 6.2 lbs. silicon, gives us 5,000 lbs. with 114.4 lbs. silicon.

The mixture would therefore have 2.28 per cent, which is near enough to 2.35 per cent, to pass. It is probably the simplest way to get it out. You can calculate it in your office in a few minutes, and be certain that the casting will come out right, if the mixture is properly handled and your materials are good.

Now, what is needed to make this work on mixture making successful? Simply a knowledge of what is in your pig iron, and what is in your own scrap. Even this can be narrowed down to the silicon in the items for the daily run of work. I will go even further and say that two or three determinations of silicon a week, together with stocks of irons, well sampled and analyzed as they are bought, and an occasional sulphur determination of the coke, is all that the jobbing or stove founder requires. I know cases where this work amounts to less than six dollars a week, or not even the wages of a laborer. I feel quite certain that many a young chemist would be glad to locate in a foundry centre if he can get that much from three or four foundries to begin with.

The above is naturally based upon the supposition that you, your sons, or your managers will do the thinking, the chemist only the manual work. Where you have enough thinking to do in this line to afford a good man in your works, get him, and your foundry foreman will thank you for relieving him from the responsibility and sleepless nights occasioned him by the changing of irons.

The application of rational methods in a foundry must be systematic to bring about the desired economy. It will not do to get an analysis of a chip of iron, pay ten dollars for it, and expect that your mixture will cost you two tenths of a cent per pound less laid on the charging platform. I read of a man recently who did this and then asked the foundry world at large what to do with his ten dollar analysis—his gold brick. If he quietly sits down and thinks over what has been outlined above, he will see the necessity for going at the problem slowly, carefully, and, once the idea is absorbed, working it out systematically. He will then wonder at the extreme simplicity of science applied in every day foundry practice.

Now comes an altogether different line of economy. How about your cupola house? Is your cupola tender really a man who will take pains with his work, or does he make a mystery of his job, keep the foreman at a distance, want only such and such irons, and go home when told to distribute his charges better? Have you still men with you who shovel in the material in a general mixture without separating into charges? I saw this done the other day and wondered what the castings would be like. Go among the molders a little and get their views on the iron tapped out and ten chances to one you will find the troubles coming from the charging platform. I had a cupola tender one day put on his coat and go home during a heat, and telling the men he would be sent for in the morning. I asked an intelligent laborer

to jump in and better his prospects in life. My foreman and I staid with him until he became proficient according to our standard of measurement. The result was better iron, no chances taken with the cupola and the charges, and the latter weighed correctly. Today that laborer is getting three dollars a day. The moral is: Go up and watch your men weigh out and charge; watch them daub cupola and ladles, make bottom, and see if things are done with precision and judgment. Here is a chance for foundry economy as shown by hot iron of uniform composition and gotten out in quick time.

I mentioned chemical specifications for pig iron several times. This is simple enough. We deal with silicon, sulphur, phosphorus, manganese and total carbon, important in the order named. The limits of these elements in foundry work are now generally known, and so we simply specify like this: For ordinary medium weight machinery castings, silicon 2.50 per cent. This does not mean 2.00 per cent. to 3.00 per cent, or even 2.25 per cent to 2.75 per cent, but nothing wider than 2.40 per cent to 2.60 per cent silicon. Make an agreement that everything between 2.25 per cent and 2.40 per cent takes the 2.25 per cent price, and you will have no difficulty in getting what you want.

To resume—Manganese is specified to be not over 0.80 per cent, unless special reasons require an extension of this limit. Similarly, phosphorus not over 0.80 per cent. Sulphur should not exceed, 0.05 per cent, and if very soft castings are wanted total carbon may be required not under 3.75 per cent.

With the purchase of pig iron under chemical specifications, a good method of making mixtures which can be depended upon to produce the results desired, and the proper disposition of the charges in the cupola, the good that science can do the founder is accomplished in the main. There are of course many points which a well managed laboratory can place on an economical footing, especially when we turn to furnace irons, and special lines of castings. For the owner of a foundry who turns out say, ten tons of castings every other day, it would, however, be unwise to establish this department as an adjunct to his works. He does better by sending his work out and learns all he can to apply the reports he gets properly.

Let it be understod that a good mixture mis-managed will give poor castings, but a poor one cannot under any circumstances turn out good work. The sole object of all this scientific manipulation is to start you off right, and then you must follow it up with due vigilance through every department of your work.

MODERN STEAM ENGINE PRACTICE ABROAD—II.

IT is interesing to note that the little country of Belgium is not behind in electrical development of central station apparatus and that the manufacturers are not only up to date in the equipment of their shops but their output is of the highest grade and well worthy of careful study.

Among the leading engine builders and constructors of direct and alternating current machinery for central station work are, the Ateliers de Construction H. Bollinckx of Brussels; Messrs. Van den Kerchover & Company of Gand; Electricite & Hydraulique of Charleroi, and the Compagnie Internatinale d'Electrique of Liege. The two former firms make a specialty of high power engines for direct connection, and the latter two have installed the machinery of both direct and alternating current types for some of the best lighting, railway and power stations in Belgium.

The central stations at Liege, Belgium and Ixelles (Brussels) are equipped with direct current apparatus of the International Electric Company of Liege, the former having a capacity of 1,400 horse power and the latter of 540 horse power. It is interesting to note the neatness and solidity as well as the attractive arrangement of the switchboards, generators, engines, and in fact, everything connected with these plants.

The Liege central station supplies current for lighting and for tramways and is

supplied with well equipped storage battery of ample capacity. The engine and dynamo room is supplied with three direct connected units of 240 I. H. P. each, for operating the tramway load; four direct connected generators and engines of the vertical Willans type of 135 I. H. P. and two units of 60 I. H. P. each for the lighting load. The Ixelles plant is equipped with direct current generators coupled to triple expansion engines of the Willans-Robertson type. The forty kilowatts direct current generators as well as the 215 kilowatt or 150 h. p. three phase alternator combination built by the Compagnie Internationale d' Electrique are direct connected to vertical engines, while three phase alternators of 2,200 volts including those of capacity or 300 kilowatts are constructed for belting to engines, the larger 1,000 h. p. machines being designed for slow speed horizontal compound engines.

The Belgian engine now being installed quite extensively by Messrs. Van den Kerchover of Gand has a valve gear of particular interest to the central station engineer. The steam is distributed to the cylinders by means of piston valves operated by a trip gear of a similar construction as that used with drop valves. This engine is of the tandem compound type, and a large engine of this construction of 1,000 horse power direct connected to a Belgian three phase alternator built by the Cie Internationale d'Electrique of Liege will serve the purpose of an accurate description. The polyphase generator supplies a current of 2,200 volts at a frequency of 50 periods per second, the revolving field of which acts as a flywheel for the engine. The armature is stationary and is designed to supply a current of 1,000 kilowatts. The revolving field consists of 72 poles, and the required frequency was obtained when the engine operated the inductor at the rate of 83 1-3 revolutions per minute.

The engine cylinders are 630 m-m and 1090 m-m in diameter and are arranged in tandem, the stroke being 1,200 m-m. Cast iron distance blocks are placed between the cylinders to hold them in proper position The guide frame is bolted to the low pressure cylinder and is bored out to receive the crosshead and blocks.

The air pump is operated from the crank pin by a lever and the method of connecting the piston rod to the crosshead by a cotter may be noted, the ears on the crosshead being pinched together.

The principal difference between the action of the drop valve of a trip gear, and the valve gear here described, is that a drop valve in falling often strikes upon its seat with a considerable shock which is not entirely take up by the dash pot. causing frequenly, considerable noise. The piston valves of the Belgian Van den Kerchover engines it will be noticed in the details, have a free path in which to move for some distance after the port has been closed, and this free motion permits of the dash pot coming into play and stopping the valve without any noise or shock. It is claimed that the velocity of these valves as they close the ports gives this design all of the advantages of the Corliss system.

The complete jacketing of the valve cylinder covers as indicated, with steam chest pressure is of particular advantage while the entering of the steam upward through the valve allows the water entrained in the steam to pass away and not give trouble in the cylinder. Another advantage claimed by the builders for this arrangment of the valves in the cylinder covers, is that the clearance is reduced to a minimum, and the amount of surface heated by the incoming steam is small.

Another claim for this valve gear which would seem to be true is that the effort to move them is very small, and the wear should also be very small on account of the valves being balanced or in equilibrium as regards steam pressure.

The upper valve is the admission valve and the lower one the exhaust valve, so that the drainage through the exhaust-valve from the cylinder should be extremely good. The ports in the liners are parallel slits with square ends at the bottom and half circles at the top. The object of this construction, is to maintain a quick cut-off, the valves opening the ports while being lifted and shuts off the ports while descending.

A jet condenser is used for the exhaust steam of the 1,000 horse power engine, and the water of condensation in the main pipe to the high pressure cylinder, as well as the water entrained in the steam, passes into a large separator which insures

dry steam for the engine. Between the high pressure exhaust and the entrance to the low pressure cylinder there is also a provision made for collecting the entrained water.

It is claimed that the three phase alternator operated by this engine has a very high efficiency, not lower than 94 per cent, while the exciting continuous current required is very small, a total of 23 kilowatts only being necessary at a potential of 110 volts.

The engines of the Belgium engine builders, the Ateliers de Construction H. Bollinckx, of Brussels, contend that it is more desirable to use a compound engine of comparativley low pressure than it is to install in a central station a high pressure triple expansion engine using superheated steam. It is interesting to note the type of engine built by this firm and as an example for description. The large unit used to operate a direct connected Belgian polyphase alternator built by Electricite & Hydraulique, of Charleroi, will serve the purpose.

The generator is capable of delivering a current of 225 amperes at a potential of 2.200 volts. The speed of the revolving field, having 64 poles supplying a frequency of 50 cycles per second.

The engine has a high pressure cylinder of 700 m-m (27.56 inches) and a low pressure cylinder whose diameter is 1,150 m-m (45.27 inches), the stroke being 1,500 m-m (59 inches). The generator was operated by this horizontal engine at a speed of 80 revolutions per minute, the mean piston speed being 4 meters(about 13 feet)per second. The air pump has a diameter of one meter (39.37 inches) with a stroke 275 m-m (10.82 inches) long. The piston rods measure a trifle less than six inches and the main shaft is 500 m-m (15.69 inches) at the center while at the bairings it measures 380 m-m. The cylinders are separated by a distance of 4.8 meters, (15. feet 9 inches) between centers. The volume of the receiver is 2 cubic meters (about 70 cubic feet.)

It is claimed by these Belgian engineers that the low pressure compound engine is superior to the high pressure triple expansion engine on the grounds 1—of low installation, cost; 2—on the basis that the superheated steam costs from 12 to 15 per cent more than saturated steam while the consumption of steam is not less than the compound engine by more than 2 per cent; 3—the boiler necessary for the compound engine may be more simple and cheaper to construct. It is also claimed that the superheated apparatus requires more attention and by a higher grade of help, while the lubrication of an engine working with superheated steam is much more difficult and expensive. Another point brought out as an advantage for the compound engine is that the superheated steam engine of the triple expansion type must by necessarily work at high pressures to be econmical, thus requiring a heavier engine which would lose more power when working idle or with light load.

Motive Power from Blast Furnace Gases.

SINCE the last extended reference in these columns to the new field which has been developed for the gas engine in the utilization of the surplus gases from blast furnaces, much has been written in European technical journals, particularly in those on the continent. Some of the difficulties attending the use of this comparatively low-power and dust-laden gas have been more or less overcome in the meantime, and on account of the general interest in the subject it is proposed to print herewith those points of a paper presented by Bryan Donkin to the Institution of Civil Engineers that relate to the present state of power development from blast furnace gases.

The chemical constituents of the gases produced by smelting iron ore in blast furnaces vary according to the ore and fluxes used, the fuel burnt, and the temperature of the furnaces. They contain, however, on an average about one third by volume of combustible gases, chiefly CO, the remaining being inert CO_2 and N. The ratio of the CO_2 to the CO varied in every furnace. The higher it is—that is, the more CO_2 the gas contains—the better the efficiency of the furnace. More gas will be

produced, but it has a poor heating value, and if the percentage of CO_2 is very high the gas will not ignite in an engine. If, however, the ratio is low, and the percentage of CO high, the gas will have a relatively higher heating value.

With the present method of utilizing these gases, about 10 per cent is lost by leakage, 28 per cent is applied to heat the air blast, 40 per cent to the boiler, and 22 per cent is wasted. If the latter percentage were utilized in gas engines, it would yield about 12¼ horse-power hours per ton of iron melted, while if all the gases were burnt in gas engine cylinders to produce power, about 28 horse-power hours per ton of pig iron would be available after deducting the power required for compressing the air. When burnt under boilers they give a very poor heat efficiency, because the CO is of comparatively little value as fuel. At leat four times as much power can be obtained when the gases are treated in an engine cylinder, the method of utilizing them being more suitable. The store of power thus available has been calculated for English and Scotch furnaces at 2,500,000 horse-power per annum. The poorness of the gases is counteractd by diluting them with a smaller proportion of air than is required for richer gases. About one volume of air to one of blast-furnaces gases gives the best working mixture in an engine cylinder.

Other disadvantages are the variations in pressure and composition of these gases, their low heating value, and the dust with which they are charged. The first two difficulties are overcome by passing them into a holder before sending them to the engine cylinder, while the quantities produced are so large that these fluctuations are practically annulied. Their low heating value did not give rise to the difficulties at first anticipated, because they could be compressed at a higher degree, previous to ignition, than permissible with other kinds of gas, when used to produce power. A high thermal efficiency is thus obtained, which compared favorably with that of other types of internal combustion engines. Compressions of between 7½ and 11 atmospheres are used, and the lower the heating value the higher the compression required.

The dust with which the gases are charged is of two kinds—the heavy metallic dust deposited in the long and large gas mains, and the fine light dust which is partly removed by washing and cleaning, and partly blown out with the engine exhaust. At first elaborate and costly systems of washers and purifiers were employed, but experience has shown them in most cases to be unnecessary, and the gases are seldom subjected to any further cleaning when burnt in engine cylinders than when used under boilers; the same pipes often serve both systems. Sometimes they are washed with water, sometimes they are treated by dry processes. Such light dust as remains after cleaning is forced out with the exhaust by the action of the piston, and is not allowed to be deposited and clog the cylinder and valves. Among purifiers a new form of rotary washer has so far proved one of the most satisfactory. It is said to clean the gases effectually and take up much less space and cost less than the usual array of pipes.

Two other difficulties were also considered, the production of gas engines large enough to utilize the vast stores of power available, and the desirability of driving the air-blowing cylinders from them direct. A great impetus has been given to the construction of large motors by the discovery that blast-furnace gases could be used to drive them. They are now made in sizes up to 1,000 and 1,500 horse-power, and still larger powers are in contemplation; while the difficulty of starting these large engines has been successfully overcome.—From Engineering Record.

Regulating German Trusts—Consul-General Guenther, of Frankfort, reports that the Central Association of German Merchants and Industrials, at Berlin, has petitioned the "Bundesrath" (Council of the Empire) and the several German State governments to prepare a draft of a law to be presented to the German parliament, providing that all commercial associations of a monopolistic character in the form of "cartels," syndicates, rings, trusts, etc., organized for regulating prices or production, division of territory, or for other purposes), must be registered by law and have their articles of association approved by the respective authorities; also that they must furnish, semi annually, statements of their financial conditions, and of their profit and losses, which shall be published, if not otherwise, at least in the Reichsanzeiger, the official publication of the German federal government.

PLANT OF THE DOMINION IRON AND STEEL COMPANY.

BY WALDON FAWCETT.

IT is doubtful if there is in the entire range of the metal trades a new plant in which a greater degree of interest is centered than in the magnificent institution recently completed by the Dominion Iron & Steel Company, at Sydney, Cape Breton. This unusual interest is doubtless due in a great measure to the general impression that the establishment of this plant marks the inauguration of a new industrial era in Canada. Certainly the enterprise will bear comparison with any of equal magnitude in the United States and the general plan on which it has been carried out, as well as the equipment provided, give evidence of the judgment and experience of the American steel makers who have been the moving spirits in the formulation of the project.

The steel plant proper consists of four blast furnaces. ten 50-ton open hearth furnaces, a 35-inch blooming mill and pit furnaces, 400 Otto-Hoffman coke ovens, coal-washing and sulphuric plants and an essential by-product plant, together with a large machine shop and foundry of a capacity sufficient to take care of all the mill and furnace work. An up-to-date ore handling equipment is provided and for the handling and transportation of material in the plant there is a private railroad system aggregating twenty miles in length. Following the plan of many of the corporations in the states the company has erected on a tract of its land a number of very comfortable residences for the use of such of the employes as may desire to avail themselves of this convenience.

The fresh water supply for a plant of the magnitude of the Cape Breton establishment is, of course, an important consideration but the problem has been solved most satisfactorily in the present instance. The source of supply is the Sydney river which is located some five miles distant from the plant. A dam and pumping station have been provided for separating the fresh from salt water and the drainage from an area of 65 square miles is available for use at the plant. The dam which is 40 feet in length and has a depth of 20 feet at the center of the stream is constructed of cribbing filled with stone and the salt water side is planked with creosoted timber. The pumping station is equipped with two pumps of 3,000,000 gallons capacity each, per twenty-four hours.

For ore handling there have been provided four hoisting machines or towers of a type very similar to that in use at a number of Canadian ports for handling coal. Each tower has a capacity of 1,500 tons per twenty four hours. These towers are mounted on trestle work above a superstructure upon which is provided a double-track system for handling cars. From the boats the ore is unloaded directly to shallow bins and hoppers and from these transferred to hopper bottom cars. In the stock yard are three of the traveling machines of the type manufactured by the Brown Hoisting Machinery Company, of Cleveland, Ohio. This trio of machines are capable of facilitating the storage of six months' supply of material for the furnaces and also of rehandling the raw material during the winter operation of the plant. The stockyard is 952 feet in length and 366 feet in width. There are twenty-eight ore and limestone bins, an apportionment of seven for each furnace, and four large coke bins over the center of each skip car which takes it to the furnace.

The four furnaces were built by and under the direction of the Riter-Conley Manufacturing Company, of Pittsburg. The furnace stacks are 85 feet in height and have a diameter of 20 feet. The diameter of the hearth is 11 feet 9 inches, at the stock line 14¾ feet, and there are twelve six-inch tuyers. The Julian Kennedy patent top-filling apparatus is provided on each furnace. The furnace shell has a diameter of 28 feet at the mantle while at the top of the furnace the diameter is 23 feet. The bustle pipe surrounding the columns has a diameter of 46 feet and the tuyer stacks are of the latest approved type with ball joints and adjustable blow pipes. A structural steel skip-hoist leads from under the stock bins to the top of each furnace and affords a track for two skip cars which rest at the bottom in a steel cased

pit. The Cowper type of stoves have been provided, the dimensions being 85 feet height by 21 feet diameter. The stove chimneys which are 200 feet in height are nine feet in diameter inside the lining and provided with heavy cast iron bases and bolted at the fountain.

The 8,000 horse power battery of boilers is housed in a brick and steel building 57 feet in length and 53 feet in width. The building has two steel stacks. each 200 feet in height and 11 feet in diameter to which the boilers are connected by overhead breeching. The steam generators are of the Babcock & Wilcox type and work at a pressure of 150 pounds. The engine house which is 200 feet in length, contains five pairs of blowing engines built by the E. P. Allis Company. The engines each have a high pressure cylinder of 50 inches diameter. a low pressure cylinder of 96 inches diameter, and a blowing tube also 96 inches in diameter, the common stroke being 60 inches. Adjoining the engine house is the pump house with pumps the capacity of which is 6.000,000 gallons per twenty-four hours. By means of a pair of surface condensers the return water from the furnaces is used for condensing purposes. The three boiler feed pumps of duplex type were built by the Wilson-Snyder Company of Pittsburg. The electric power house is 130 feet in length, 51 feet in width fitted with a thoroughly modern equipment of electrical machinery.

From the furnaces the metal is transferred in 25-ton ladle cars to a motor-driven pig-casting machine manufactured by the Heyl-Patterson Company, of Pittsburg, and which has a capacity of 1,600 tons per twenty-four hours. If desired the molten metal may be moved direct to the open-hearth furnaces, ten in number and of 50 tons capacity, each. These steel furnaces are of the tilting type and the Bertrand Thiel process may be used. The furnaces are arranged in a continuous row and metal may be put into the furnace from either side or if desired cold pig iron or stock can be placed in the furnaces by the use of charging machines manufactured by the Wellman-Seaver Company, of Cleveland.

The product of these furnaces is estimated at 1,400 tons a day and this output is tapped in 500-ton ladles from which it is poured into the molds on cars and transferred to the stripper building where it is deposited in the pit furnaces. The commodious characteristic of this portion of the plant will be appreciated when it is stated that the open-heath building is 832 feet in length and has a span of 65 feet with a lean-to of 37 feet. The gas for the open-hearth furnaces is obtained in part from producers of the latest type and in part from coke ovens. There is a triple lift gas holder of 1,000,000 cubic feet capacity so constructed as to give a working pressure of a 5-inch column of water.

The blooming mill and pit furnace building has 480 feet in length and about 82 feet wide and contains sixteen pit furnaces of the latest type together with approach and main tables, hydraulic and steam shears, etc. The blooming mill is provided with a 35-inch train built by the Mackintosh-Hemphill Company, Pittsburg, and this is direct-driven bv a pair of 50x60-inch reversing engines of their latest design. For charging or drawing ingots from pit furnaces and affording other transportation utilities there are two 20-ton electric overhead traveling cranes built by the Brown Hoisting Machinery Company, of Cleveland. The boiler house of the blooming mill is 296 feet long and 46 feet wide and contains in addition to the 3.000 horse power boilers three hydraulic pressure pumps. The hydraulic system is of the return type and designed for a workng pressure of 500 pounds to the square inch with suitable accumulators and operating valves. In conjunction with the open-hearth plant there is a calcining, grinding and mixing plant of a capacity sufficient to furnish all refractory material, linings, etc. The equipment of this plant includes the usual mixers, crushers, elevators, bins and calcining cupolas.

The coke oven plant constitutes a very interesting feature of the new Canadian enterprise. There are four hundred ovens arranged in eight batteries of fifty ovens each, the batteries being ranged in two rows. The ovens are, as has been stated, of the Otto-Hoffman type. There is provided the necessary mechanism for the charging and the pushing of coke from the ovens to a quenching floor or loading platform. There is a condenser house 69 x 100 feet with a cistern adjoining of 40 x 150 feet and the requisite coolers, sieve washers, etc: for cooling and cleaning the gas. Adjacent

to the boiler house with its 1,500 horse power battery of steam generators is the ammonia house 106 feet in length by 40 feet wide.

The coal washing plant with its machinery was installed by Stein & Boericke of Primos, Pa. The building is 150 feet in length by 50 feet breadth and is fitted with raw coal bins, crushers, and washed coal bins for delivery to the ovens. The sulphuric acid plant has a capacity of 40 tons of acid a day and is equipped with apparatus which is a modification of the old chamber system. Pyrites from the mines in Newfoundland is being used in the manufacture of sulphuric acid. A tank car is provided for the transportation of the acid from the storage chambers to the ammonia house. The machine shop in its equipment is quite in keeping with the remainder of the plant. The erecting floor is commanded by a 25-ton electric traveling crane. The foundry contains two cupolas of a capacity of 20 tons an hour. The blacksmith shop is fitted with bolt header, steam hammer and other tools and the pattern and carpenter shop is adequate to all demands which may be made upon it.

The Dominion Iron & Steel Company has an authorized capital of $15,000,000 and is particularly strong in the matter of sources of raw material. The company has acquired, by purchase, iron ore property on Great Bell island, in Conception Bay, Newfoundland. Fully 6,000 tons of ore can be mined in a working day of average length and the transfer of this raw material entails a sea haul of only 402 miles. It is estimated that the mine which has passed to the control of the new corporation contains 25,000,000 tons above sea level and a much larger quantity on the lower levels. Coal mines on the lease of which the Dominion Iron & Steel Company holds an option are estimated to hold 2,500,000,000 tons of fuel. Finally the new corporation controls the Marble Mountain limestone quarries at Clark's Cove on West Bay of the Great Bras d'Or Lakes.

GAS ENGINES AND INSURANCE.

BY ALBERT STRITMATTER.

IN considering the question of power the questions of expense for fuel, attendance and repairs, the reliability of the power initial cost, receive most attention.

Underwriters closely investigate the installation of power plants and fix the premium according to the safety. The writer sometime ago directed inquiries to boards of underwriters of some thirty of our largest cities, asking information as to local requirements for the installation of gas and gasoline engines, the rates charged as compared with hand power plants and those in which steam power was used. The information received reveals the fact that while there are rules for the installation of power plants and rates to govern, yet much is left to the individual judgement of the underwriter and the charge made is entirely covered by the character and purposes for which the building is occupied, as well as by the character of the installlation.

The engine must, if possible, be located on the ground floor. In shops or factories where dust or inflammable materials are flying around, the engine must be placed in a fire-proof room well ventilated. If the engine is placed on a wooden floor there must be placed under it a metal plate with up-turned edges to catch the oil which may drip off the engine. The gasoline supply tank must be out doors and at least 30 feet from all buildings. It must be placed under ground, wherever possible, and of course must be lower than any portion of the suction or over-flow pipes between it and the engine. If, however, it is not possible to bury the tank, it may be placed in a well ventilated, non-combustible vault. Auxiliary tanks inside the building shall not be of more than one quart capacity and shall not be placed near engine. They are not to be used unless unavoidable. The engine base cannot be used as a supply for gasoline. The gasoline tank must be of iron or steel plate, properly riveted or pressed. and should be galvanized or coated with a rust proof paint. It must be provided with fill and vent pipes.

Piping is to run as directly as possible, and shall pitch toward the supply tank that surplus oil may return. The gasoline pipes must be no smaller than 3/8 inch and the overflow pipe should be one size larger than the supply pipe. All exhaust pipes shall run out doors, at least six inches from combustible materials. If carried into

a chimney, it must be taken to the roof of the building and in no case can it be left to discharge into the chimney. The exhaust pot must be at least one foot from any inflammable substances, of strength equal to the cylinder and should be cylindrical or spherical in form, with as few points as possible. It must have a drain cock near its bottom.

The gasoline feed on engine must be of cast metal, rigidly fastened to the engine, and must not be of more than one-half pint capacity. It must have an approved controlling valve and be so arranged that the gasoline will not at any time spatter out. The gasoline pump should be a simple, single plunger pump with a check valve close to it.

The ignition must be electric, but hot tube ignition is not permitted by the national board. Check valves in pipes must close against the gasoline supply. Where the fuel and exhaust valves in the engine are of the poppet type, they are to be located that gravity will act with the spring to assist in closing them properly.

On the Pacific coast the regulations for gasoline engines require the supply tank to be of iron, not to exceed 110 gallons capacity, and be buried at least four feet under ground, and not within 30 feet of any insurable building. The fuel is to be forced directly from the tank to engine by a pump. The ignition is to be by electric spark, and the supply pipe is to drain toward the tank. At an additional premium, the gravity feed may be employed by having the tank 30 feet from any building, supply pipe not to exceed ⅜-inch diameter and to be provided with a stop cock at tank and where pipe enters building, the cocks to be closed when engine is not in use. The ignition is to be by electric spark.

In New York city, the use of gasolines engine is prrohibited, the New York underwriters seeming to be far behind those in other cities by condemning the use of gasoline engines under conditions which render them much safer than steam boilers. They, however, permit the use of kerosene engines under stringent rules.

The South-Eastern Tariff Association, which regulates installation in many cities in the states, from Virginia South and East of the Mississippi river, prescribes that tube ignition shall not be used, that storage tank shall not be less than ten feet from any building, that no supply tank larger than 300 gallons shall be allowed, that no carburetor or vaporizer by which the explosive mixture is formed outside of the engine cylinder shall be permitted, unless the vaporizer has been especially approved.

It will be seen that the requirements vary, but as stated, the installation is left to a large extent to the individual agent. In some cities if the engine is located in a separate building, power being transmitted by belt or shaft, no extra charge is made. In other places this installation is considered the same as if the engine was located in the same building with the other machinery. Of course when power of any kind is put into a building, an advance is made in the rate. That is, hand power rates are lower than rates for risks using power of any kind, no matter whether electric motor, gas engine or steam engine. The rates for gas engines, gasoline engines, or steam engines and boilers, however, vary some.

The secretary of one of the central associations quotes as follows—

For gas engine, coal or illuminating, in mercantile brick building, less than 4 h.p., increased rate over hand power, per $100, 15 cents ; over 4 h. p., 25 cents; gasoline engine, limit of one gallon on premises or within 20 feet of building, 50 cents; natural gas engine, 50 cents; kerosene engine, 25 cents; gasoline and gas engine in grain elevator, 75 cents; if in special building at elevator, 25 cents.

For manufacturing plants, gas and gascline engines would be charged 50 cents less than if operated with steam plant. As indicated, we are governed somewhat by the conditions as we find them at each risk or plant, but always the operation by steam power, especially if boiler and engine are inside the building, the insurance charge is from 25 to 50 per cent above gas and gasoline engine power, if the latter is properly installed. Steam power boilers in brick building, and in brick factories 1 per cent, in frame building usually 1½ per cent to the scheduled rate."

In another locality the charge on gasoline engines installed in a separate building, at a distance of 30 feet or more, power communicated by mechanical means, be-

comes only 15 cents per $100 over hand power. In Philadelphia no charge is made for steam engines in a building, but for steam boilers a charge of from 1 cent up is made according to the kind of boiler and the construction of the boiler room. In New England there is an additional charge of 10 cents per $100 for each 10 feet or fraction less than 30 feet that the supply tank is distant from any building.

In some places the underwriters are so very far behind the times that our regulations have been made regarding the installation of gas and gasoline engines. There is a large city within a hundred miles of Pittsburg from which the following reply was received in response to inquiries made along this line;

"We have so few of the above mentioned machines in use in this city that our board of underwriters have not adopted special rules governing installation and operation." What is meant by a "few" I do not know, but do know that there are as many such engines in operation in that city as in almost any other of its size and location.

It is not always possible to install engines under the prescribed rules, but in almost all cities gas or gasoline engines, properly installed, are rated much below steam engines and boilers. This fact should go far to correct the impression many persons have that gas and gasoline engines are more dangerous than steam plants. Insurance companies after careful investigation have decided that a gas or gasoline engine is a preferable risk to a steam plant.

Unalloyed Aluminum—Professor Wilson's paper read before the British Association. and the discussion following, clearly established that whatever may be said of aluminum combined with other metals, unalloyed it has disappointed many of the expectations based on the discovery of a cheap method of its production. "Aluminum," said Professor Wilson, "does not exist uncombined in the metallic state, being essentially a product of chemical industry. Aluminum can be used to produce an enormous number of alloys, some of which, containing one or two per cent of other metals, combine the lightness of aluminum with greater hardness and strength. On the other end of the scale, alloys containing from 90 to 99 per cent of other metals exhibit properties of those metals, but much improved for certain purposes. Unfortunately it is when aluminum is used alone that its chief recommendation—lightness—is found to be counterbalanced by other considerations. The efforts that have been made to use aluminum wire for telegraphs and telephones have not been very encouraging, owing to the uncertain texture and weakness of the drawn wire. The same difficulty occurs with tubes and sheets of the metal. No guarantee of strength can be obtained from the manufacturers short of thickness far in excess of what would be required of copper and still harder and tougher alloys. There is consequently no advantage in using the lighter but more uncertain and costly metal. The chief advantage of commercial aluminum appears to be for the construction of cooking utensils. A great difficulty is found in soldering the metal; and it will not stand salt water. On the whole, therefore, aluminum must be classified by practical men as a disappointing metal.

Shipping to Greece—In confirming his recent telegram to the Department announcing that a United States firm had been awarded the contract to supply 500 tons of sulphate of copper to the Currant Bank of Greece, Consul Jackson, of Patra, says that in all seven bids were received, representing American, English, German, and Belgian firms. The bid of the successful American company—$45,015 for the 500 tons c. i. f. Patras—was $5.84 per ton lower than that of the nearest competitor. When the results of the bids were made public the following day, negotiations for 300 additional tons were begun by private firms, and, in the opinion of the consul, the United States will capture this year a large precentage of the Greek market for this product—a market worth, at a low estimate, $450,000.

The consul adds that the success of the American offer was wholly unexpected by the European companies, several of which were of the belief that their prices had been cut so close as to render competition improbable. In fact, the American product was not considered at all on account of the exacting conditions governing the contract and the high trans-Atlantic freight rates.

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EDITORIAL COMMENT.

The Roberts Resignation—The resignation of Percival Roberts Jr., from the Executive Committee of the United States Steel Corporation may not have been a surprise to those on the inside of the affairs of the concern. Indeed it is doubtful if the retirement of Mr. Roberts was a surprise to those who have no knowledge of the business of the Steel Corporation. If the big concern is to furnish surprises the movements must come in some other form than the resignations of members of the directing subdivisions of authority. One man, regardless of his identity, will neither mar nor make the United States Steel Corporation. The American combination is geared to a tremendous speed and it would be almost miraculous if so many men, eminent and successful in different branches of the production and uses of iron and steel, should move in perfect harmony on all business points. The retirement of Mr. Roberts may mean that the United States Steel Corporation proposes to exact the same penalties for failures measured by its standard, whether the delinquent or dissenter is a member of the Executive Committee or a man employed at tonnage rates in the mills of its constituent companies. What the United States Steel Corporation wants is results, and its financial directors will ask no questions as to methods and will accept no explanations concerning the causes of failure to reach the required standard.

The disaffection of Mr. Roberts has its genesis in the policy generally credited to President C. M. Schwab, the possibilties of which were hinted at in this column last week. How far President Schwab's policy is to extend or what the ultimate result will be remains entirely with the future and probably not the immediate future. Whatever the remote effects of that policy it cannot receive the support of Mr. Roberts. He made a statement the day he resigned to the effect that his retirement was due directly to the fact that he refused to subscribe to the policy of President Schwab. A few days later Judge E. H. Gary announced that the retirement of Mr. Roberts was the consummation of an intention expressed some months ago and which was temporaily laid aside. He explained that Mr. Roberts' home is in Philadelphia and that he naturally objected to spending his time in New York. Judge Gary probably meant that for a joke. Men in the position of Percival Roberts do not object to living in Philadelphia because their business interests are in New York, nor do they object to doing business in New York because they live in Philadelphia. Neither do men give up a position in the Executive Committee of extensive business enterprises because their homes are not in the cities in which the principal offices of the concern is located. Perhaps Mr. Roberts knew what he was talking about when he said that he retired because he could not consent to the policy of President Schwab. Whether Mr. Roberts or President Schwab is right as to that policy only the facts of the future can tell.

Blast Furnace Report—The figures from the blast furnaces indicate that the production is up to probably what may be regarded as an average or even higher than a mere average. The change in the aggregate production from last month is merely a matter of some 2,000 weekly tons. That would run only some 100,000 tons for the year, a trifle considered in comparison with the total. The report of next month will probably show a heavy increase in the number of active stacks and the weekly tonnage, as this is the season when the blowing in of idle furnaces is most active.

In the light of the figures of the blast furnaces the famine in iron and steel is far ahead. With a better fuel supply the number of active stacks will be increased and the product of those that have been in blast will be largely added to, so that the fears of a probable famine may be dismissed. With the consumptive demand so far reaching, however, the year is likely to be one of relative shortage, but not a famine.

Personal.

The directors of the United States Steel Corporation March 4 re-elected President Schwab and all the others officers whose terms expired. Percival Roberts, Jr., resigned his membership in the executive committee. His resignation was accepted, but a successor was not named. He did not resign from the board of directors. Mr. Roberts was president of the American Bridge Company when it was merged into the United States Steel Corporation. He represented a capitalization of $80,000,000.

J. C. William Greth, formerly connected with the Pittsburg office of the Frick Company, builders of engines, etc., Waynesboro, Pa., has accepted a position as manager of the purifying department of the William B. Scaife & Sons Company, Pittsburg.

J. H. Orwig has severed his connection with the Niles Boiler Company, Niles O., and the management of its business. E. A. Gilbert, who has been associated with its business since the beginning, has been made superintendent and secretary.

J. E. Lauck, formerly manager of the United States works of the American Tin Plate Company, at Demmler, will be manager of the new works of the McKeesport Tin Plate Company.

Thomas A. Mack & Company, pig iron brokers of Cincinnati, have establishded a branch office at 160 Empire building Pittsburg.

OBITUARY.

JAMES A. CRAWFORD—James A. Crawford, one of the pioneer iron men of this part of the country died a few ago days at his home in New Castle. Mr. Crawford erected the first blast furnace in Pennsylvania West of Pittsburg. It was located at New Wilmington and for a short time under the control of William McKinley afterwards president of the United States. Subsequent to the New Wilmington plant there were other interests taken. Mr. Crawford was connected with the majority of the industries of New Castle. He was also connected with the first railroad enterprises in that section.

O. C. DEWEY—A pioneer in the iron and cut nail industry in the Wheeling district, died in that city March 5, aged 69. His mill, operated in the 50's, was the parent of the Riverside plant with which Frank J. Hearne, J. D. Culbertson and other prominent manufacturers were connected. He retired 20 years ago and has spent his entire time in travel, and the gratification of his artistic and musical tastes.

COL. WILLIAM STONE—The McLanahan-Stone Machine Company announces the death, February 16, of Col. William Stone, the company's vice president.

Dedication of the Gayley Institute—The laboratory of chemistry and metallurgy, at Lafayette college, which has been in process of erection for some months, the gift of James Gayley of the class of '76, will be dedicated April 5.

Mr. Gayley, now first vice-president of the United States Steel Corporation, is one of the most successful of the recent graduates of Lafayette. He early made his mark as a blast furnace superintendent of the Edgar Thompson steel works of the Carnegie system, was regarded as one of the ablest blast furnace superintendents in the world, the production of Bessemer steel by the Edgar Thomson steel works being regarded as one of the triumphs of American industrial development. The laboratory is a testimony from its generous donor to his obligations to the college from which he graduated and to his affection for it.

The dedicatory addresses will be made by three distinguished chemists and metallurgists of America, President Ira Remsen, of Johns Hopkins University; President Thomas M. Drown, of Lehigh University, for a number of years professor of chemistry at Lafayette; and Professor Henry M. Howe, of Columbia University.

The ceremony of presentation will be performed by Mr. Gayley, and will be followed by the dedicatory paper by his father, Rev. Samuel A. Gayley, D. D., of the class of 1847.

In addition to the dedication of the building, the use of the Henry W. Oliver library of chemistry will be inaugurated at this time.

Magnetic Movements of Steels—The London Engineer says that the permanent magnetic movements of a number of specimens of steel made at the Resitza Iron Works of the Austro-Hungarian Railway have been experimented on by Herr A. Abt. The collection of steels comprises ten carbon steels, two manganese steels, six steels with a specially high percentage of manganese, six chromium steels, six tungsten steels, two nickel steels, and two nickel-chromium steels. The magnetic movement reaches a maximum with a magnetizing current of 20 amperes, but the maximum in the case of the strong manganese steels is already attained with 10 amperes. The latter also has the smallest permanent magnetic moment. The highest permanent magnetism is shown by the nickel-chromium steel. One brand of manganese steel containing much manganese shows no permanent magnetism at all.

IN AND ABOUT PITTSBURG.

The United States Steel Company of West Virginia has filed a bill in the United States Court against the Jupiter Steel & Coal Company and William J. Wilson, asking that an agreement with the defendants be canceled. The United States company sets forth that it holds certain patents for making steel castings and that Wilson represented that he and others owned stock in the Jupiter company and wanted to manufacture under the patents. For his right 25,000 shares of full-paid and non-assessable stock of the Jupiter company would be paid. It was also represented that the Jupiter company had 4,500 acres of coal land and ample capital. The United States company asserts that the land was not secured by the Jupiter company and that the latter had no funds to build a plant. By reason of this the stock issued to the United States company is of no value and the representations made were false. The company offers to surrender its Jupiter stock and asks that the license to manufacture be declared void.

The contract for the iron structural work of the hot and cold mills, tin house, machine shop, store rooms, assorting house, engine rooms and boiler houses of the McKeesport Tin Plate Company, have been awarded to the Fort Bridge Company. The contract for two 15-ton electric cranes has been given to the Whiting Electric Company of Chicago. Two double annealing furnaces will be built by the Forter-Miller Engineering Company, of Pittsburg. The light and power plant will be erected by the Keystone Electric company, of Erie.

An order was made a few days ago in the United States Circuit Court in the case of the Pressed Steel Car Company against John M. Hansen, restraining the latter from assigning certain patents or pending applications for patents or from interfering with applications for patents. Hansen was chief engineer of the company and it is claimed his inventions were to be the property of the company. He left the company January 1 and it is claimed has refused to assign certain patents to the company and that he conspired with others to engage in a competing business, known as the Standard Car Company, in which he is the majority stockholder.

Negotiations between Pittsburg capitalists and the owners of the Whitney glass plant at Blairsville, with its accompanying 35 acres of land, for the sale of the property are in progress. It is intended to use 20 acres of the land for the erection of a large tin-plate plant, of which A. E. Piper, until recently superintendent of the Star tin mill at Pittsburg, will be manager. The plant will have 10 hot mills.

Arguments were heard March 7 in the United States Circuit Court before Judge Buffington in the case of R. D. Gibson against the Standard Automatic Gas Engine Company and others, in which a receiver is asked. In the bill insolvency is charged: also, that some of the directors are guilty of conspiracy. For the plantiffs it was contended that the affairs of the company should be wound up by a receiver, while the defendants hope to see the property sold by the sheriff. J. B. Smithton president of the company, states he would bid $57,000 for the business which is an amount greater than the value of the assets.

The Pittsburg Stove & Range Company will ask, April 29, for amendment to its charter to permit the sale of property. As is known the purpose is to concentrate plants at Beaver Falls which will render necessary the sale of existing works and properties. The several foundries have been dismantled. It is believed that many economies of management and manufacture heretofore impossible will be secured. Most of the present plants are old and the operation is costly.

Additional patents were issued March 4 to S. A. Cosgrave covering his process for making a compound ingot and the mold in which the ingots are cast. The additions covered by the new patents are the result of observations taken at the tests made on a compound armor plate at Indian Head. Those interested are Aaron French, John M. Patterson and the inventor, Sylvester A. Cosgrave all of Pittsburg.

The American Bridge Company has been awarded the contract for constructing the new South Tenth street bridge. Its bid of $248,000 was the lowest; $4,000 was allowed by the company for the metal in the old bridge. The contract work for the substructure was awarded C. M. Diver for $35,773.

The National Bridge Company, which has secured a site for its plant at South Monaca, has awarded to the Browning Engineering Company, of Cleveland, a contract to build a heavy traveling crane and to Westinghouse, Church, Kerr & Company, a contract to provide a high power gas engine.

The Manufacturers' & Producers' Supply Company has received a contract from the South Jersey Gas & Electric Light Company for 40 miles of 12-inch pipe at a cost of $200,000. Shipments will be started this spring and be hurried during the early summer.

Col. J. M. Guffey, through his agents, is obtaining options on all the coal land in the Eastern part of Taylor county, West Virginia, cover-

ing many thousand acres and located about 75 miles West of Cumberland, Md.

William S. Thomas, Harry H. Patterson and Edmund W. Arthur, of this city, will make application, April 29, for a charter of incorporation of the Monongahela Foundry & Forge Company.

Charles E. Dickson, H. H. Hyland, G. S. Lewis, W. H. Sponsler and Edward R. Sposler have organized the Pittsburg Piston Packing Company and will apply for a charter on March 24.

NOTES OF THE INDUSTRIES.

The British steamship Myrtledene, Captain Yule, is at Philadeplhia from Middlesborough-on-the-Tees, England. discharging 300 tons of Cleveland pig iron. The cargo is the first consignment of 9,000 tons of pig iron recently purchased by firms in that city. Other shipments are expected to arrive soon. Last November the German steamship Hispania arrived from Stetten with 2,800 tons of spiegel iron and negotiations are pending for the shipment of pig iron from the same district. For a vessel to come to Philadelphia from the North of England with iron is unusual, and while the freight rate paid the Myrtledene is only $1.65 a ton, ship owners regard its acceptance as a better business venture than hazarding steamships in Western ocean voyages at this season with water as ballast.

Canadian capitalists have finally secured control of the iron and steel industries at Sydney, Cape Breton, and will hereafter conduct those enterprises exclusively in the interest of Canadian capital and labor. Mr. Whitney and other United States capitalists, who started the Dominion Iron & Steel works, sought to identify the development of Cape Breton with the United States Steel Corporation, but the Canadian interest insisted on an independent attitude, and finally won the day. The result is the withdrawal of Mr. Whitney and his American manager in favor of Mr. James Ross, of Montreal, and a Canadian manager. The Dominion Iron & Steel and Coal companies will be amalgamated and worked as one concern.

At the annual meeting of the stockholders of the Midvale Steel Company the following officers were re-elected: President, Charles J. Harrah; vice president, James F. Sullivan; treasurer, John C. Dessalet; secretary, Harry M. Deemer; and directors, Charles J. Harrah, James F. Sullivan, William Sellers, John Sellers, Jr., and Axel A. Petre. Reports showed 1901 to have been the most successful year in the company's history. During the year the plant was extensively improved and enlarged, new hydraulic presses, furnaces, foundries and machine shops having been added. The company also added new shops for building marine engines and will make this a feature of its work in the future.

The combine of railway spring companies has established general offices in New York city at 71 Broadway. The executive officers and financial affairs of the corporation will be centered at that point. It was announced that there would be no change in the operating heads of the various plants taken into the corporation for the present, and each individual concern will be conducted as heretofore.

The South mill of the Lackawanna Iron & Steel company, at Scranton, has been closed. The last rail was straightened by Thomas Karney who straightened the first rail made in the mill, eighteen years ago. The last rail was cut up into souvenirs. The work of tearing out the machinery and removing it to the new plant of the company, at Buffalo, has begun. This puts an end to the steel rail industry in Scranton.

An entire reorganization of the American Bridge Company is expected to follow the retirement of Percival Roberts, Jr., former presiden of the Pencoyd Bridge Company, from the executive board of the United States Steel Corporation. The officers of the United States Steel Corporation, state that when April arrives completing its first year, the earnings will aggregate $111,000,000.

The Republic Iron & Steel Company has decided to dismantle one of its old mills, Youngstown, and will utilize the ground by the erection of three finishing mills, 10, 8, and 7-inch mills, in order to enable them to fill heavy orders promptly. The construction will be commenced as soon as the ground can be cleared.

The Pennsylvania Chain Company, which was recently organized at Harrisburg, Pa., will probably close negotiations for its location this week and will soon break ground for its works to contain about 60 fires. None of the equipment has been purchased.

W. W. Thomas of Los Angeles, Cal., was in Pittsburg a few days ago in the interest of large copper mines in Arizona. A company known as the Black Hills Copper Company was

recently organized, mainly with Pittsburg and Boston money. While actual operations have not been commenced Mr. Thomas was here for the purpose of purchasing machinery.

The American Car & Foundry is going largely into the manufacture of steel frame cars. The company is making a specialty of the steel frame car, and has completed 750 for the Pennsylvania railroad. It has orders booked for about 10,000 many of which are for the Pennsylvania.

The Sharon Brass Company, with a capital of $50,000, has been organized. M. O. Shrock was elected president, and J. L. Merritt, of Greenville, S. C., secretary. R. A. Wilson and T. L. Woodward, of Pittsburg, are directors. A plant will be erected on Ellsworth avenue, Sharon.

The Susquehana Iron & Steel Company, Columbia, Pa., has issued a circular to stockholders, announcing that the company is now ready to receive subscriptions for the issue of $300,000 worth cf gold bonds for the purpose of raising money to build the proposed pipe mill at Columbia.

During February the Tennessee Coal & Iron Company alone sold 200,000 tons for periods of delivery extending to the close of 1902. Small amounts of iron have been sold for delivery early in 1903, but not enough to count as factor in calculations for next year.

The Warren Foundry & Machine Company's plant, at Phillipsburg, N. J., is shut down because of the company's inability to secure stock, on account of the damage to the New Jersev Central Railroad, the tracks of which run to their plant.

W. W. Comstock, of Cleveland, reppresenting a company which manufactures springs for agricultural implements was in Pittsburg during the week. "Our business," he said, "has been seriously crippled by the lack of railroad facilities.

The returns from the Southern district show that 806,000 tons of pig iron have been sold for delivery at various periods from March 1 to the close of 1902. This leaves only 456,000 tons of the current year's possible production unsold.

The American Tin Plate Company's six-mill plant at Atlanta, Ind., is being dismantled and three of the mills are being moved to Ellwood to be consolidated with big South Side factory.

The Lebanon Iron & Steel Company, Lebanon, Pa., has been organized by Messrs. Paul H. Denniston, Harry M. Kurtz, William E. Stokes and others, who will erect a new plant.

Contracts aggregating $350,000 have been let by W. W. Daley for the machinery and equipment of the St. Louis Plate Glass Company, which will be built at Valley Park, near St. Louis by Pittsburgers.

The directors of the Central Iron & Steel Company, Harrisburg, Pa., have decided to go ahead with the construction of a number of open hearth steel furnaces.

Reader Brothers & Hoffman, Tyrone, Pa., have completed their new boiler shops, which are 80x80 feet and equipped with the latest boiler making machinery.

After a continuous run of five years and four months No. 1 blast furnace of the Warwick Iron Company, Pottsown, Pa., went out of service for repairs.

The Salem, N. J., Board of Trade is in correspondence with a firm that desires to locate there for the manufacture of iron fences.

The John Wood Manufacturing Company, Conshohocken, Pa., will add a new air compressor, etc., to its machinery equipment.

The Fleetwood Foundry & Machine Company has been organized at Fleetwood, Pa., with a capital of $50,000.

The Reading Iron Company raised the wages of its employes at Emaus, Pa., about seven per cent.

The Warwick furnace, at Pottstown, Pa., is in operation, after the stoppage by high water.

No 2. stack of the E. & G. Brooke Iron Company, Birdsboro, Pa., was put in blast March 10.

WEST VIRGINIA NEWS.

The Mound Coal Company at Moundsville has awarded a contract to the George Whitcomb Company, Chicago, for air compressors, new mining machinery, etc. There remains to be bought a large amount of new machinery. The capacity of the plant will be increased to 1,000 tons daily.

W. L. Hearne, a Wheeling capitalist will build an electric railroad from Wheeling to Bethany. The road will be about 16 miles long, and pass through one of the richest farming districts in the valley. A part of the right of way has been secured.

The foundation beneath one of the engines in the Whitaker works, which sunk three months ago throwing one fourth of the plant idle, is

about finished. The entire plant will resume March 17.

The Wheeling Traction Company has ordered two extra engines, two generators and a new battery of boilers. all of which will be installed in its Forty-second street station.

The Howard Coal & Coke Company, at Wilsonburg, has closed its works for three months. Electrical mining machinery and new haulage system will be installed.

The Wheeling Bridge Company which will be located on the Board of Trade's ground above the city has been organized and a charter asked. The capital stock is $500,000 of which $125,000 has been subscribed.

Vice President Joseph Speidel, of the Central Glass factory announces that the new factory, rebuilt after last fall's fire will be making glass by March 17. Three furnaces will be started.

The Cincinnati District.

State charters have been granted to the Neer Manufacturing Company, St. Paris, O., to make harvesting machinery, capital $20,000; the incorporators are John E. McMorran, M. W. Thomas, Grant McMorran, Adam Neer, O. S. Berunt, G. P. Shidler and A. C. Brown; Cleveland Automatic Molding Machine Company, Cleveland, O.. $10,000 by George F. Kast, L. A. Ritzman, J. W. Battenfield J. W. Burrel and William E. Patterson; The Insurance Stove, Range & Foundry Company of Covington. Ky., capital $200,000, by H. H. Uchotte, F. Breiner, F. Feltrup, George Uchotter, and Frank Uchotter; The Blessing Shoeing Forge Company, Toledo. O., capital 10,000 by Otto F. Benura, Frank Janes, Charles H. Norris, Maud F. Benura and Leonard S. Johnson; The Columbia Telephone Manufacturing Company, Ottowa, O., capital $250,000 by James G. Nolan and F. J. Mason of Chicago, W. H. Harper, Jr., C. H. Rice and G. W. Risser, of Ottowa; The Orville Manufacturing Company, Orrville, O., manufacture wood metal goods, capital $5,000.

Herman Belmer, president of the Belmer-Eames Tool Company, this city, made application last week for a dissolution of partnership, a receiver and a restraining order against Gardner T. Eames, his partner, to prevent him from disposing of any of the assets of the company or collecting any money due it. In the bill Mr. Belmer states that he has invested $59,000 over the original capital, which was $7,500. The company is operating a plant in Fairmount, a suburb of Cincinnati, and makes a specialty of large planers. Spencer M. Jones was appointed receiver.

The Cincinnati Meter Company has removed its works to Richmond and Harriet streets where the output will be more than trebled. The company was organized some time ago with $200,000 capital stock and has been operating in an experimental way until a month ago when the meter was perfected. The company is composed of N. Paul Fenner, Jr., Dwight S. Marfield, Charles E. Prior, Robert Laidlaw, William J. Isaacson, George H. Edwards and E. M. Fullington.

The Brumhoff Manufacturing Company, Hamilton, O., manufacturers of hardware specialties, will remove its works to Ninth street and Freeman avenue and increase is output. The Cincinnati Industrial Bureau was instrumental in locating the company.

The Hallwood Cash Register Company, of Columbus, has secured a site at Toledo, O., upon which it will build a plant and remove its works from Columbus.

Machinery in a Wilderness—The London Engineer says that the Societe Miniere et Commerciale de Satadugou, French West Africa, had to send across Senegal a complete dredging and excavating plant, weighing nearly 100 tons, for the gold bearing placers on the banks of the river Faleme. The twelve wagons containing it were run on 60 meters of rail that were successively taken from behind and laid down in front, in which manner nearly 200 kilometers were traversed in two or three months, under the direction of engineer Moufflet, notwithstanding great difficulties of all kinds.

Mining Machinery Export—The new year has not opened well for the mining machinery export trade of this country, the shipments during January last only attaining a total of £41,064, as compared with £51,450 in the first month of last year and £46,059 in January 1900. Curiously enough it is not South Africa which is the cause of the decline, for to that market plants to the value of £13,392 were exported in January, as against only £12,589 in the same period a year ago. Australia, too, took rather more than last year, but on the other hand there was a noticeable falling off in the trade with the continent and with other countries.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—The markets present nothing of feature beyond the conditions that are crowding producers and consumers more than at any time in the history of iron and steel making. The situation has resolved itself into one of patient waiting by both sides. The books of manufacturers are completely filled with business that will run throughout the year and new contracts are out of the question. Nothing offered is even considered so thoroughly is the aggregate tonnage covered by contracts placed early in the year and during the closing months of last year.

The consistent action of the producers in declining to accept new business and in declining to make advances on current deliveries has had the effect of convincing the consumers that the offer of premiums will have no effect. The entire situation is on a basis of solidity and permanency and nothing that the producers may do will affect that stability and nothing that frantic consumers may do will affect the markets adversely. The excitement for the most part comes from the smaller consumers and in the end will not work harm to the general conditions.

From this time to the end of the year there can be little if any change in the conditions except that there must come some improvement in the matter of supply and transportation. That is the whole problem at present. The many small finishing plants operating independently are quietly taking up the limited surplus of billets or rather will when the time comes, so that the total tonnage will be extremely closely used up. Prices are not likely to undergo changes save in the event of the totally unexpected and violently disastrous, not at present in view to the most careful observers. The tendency to inflation of values incidental to the shortage in ready material under unusual circumstances has passed away leaving the conservative element in complete control of the markets.

The arrival of the season when the movement of coke will be materially better than for the greater part of the past year will have the effect, the good effect, of permitting all the capable blast furnaces to operate to their full capacity. That in turn will provide a stronger supply of iron and that a materially improved supply of billets and so on through the finished lines of steel. That will give considerable ease to the situation but will permit of relatively little new business. Prices have not made any changes in the raw materials but there is a long difference as usual between the merely nominal rates and those that figure in the few small sales.

Bessemer may be quoted at from $16.00 to $17.00 at valley furnace. Billets may be quoted at any price but as there are none to be bought, the nominal rate of $30.00 will do as well as any other although reports are that sales have been made for $33.00, per ton at mill. Forge iron is phenomenally strong at $17.25 to $17.50, Pittsburg delivery. Muck bar is quotable this week at $32. Steel skelp has advanced to $1.80 and $1.85 and iron skelp to $1.90 and $1.95.

CURRENT QUOTATIONS:

Basic	$17 25		Splice bars	1 50	
Bessemer		17 75	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	16 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 69	1 74
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Grey Forge, Shn	15 60		No. 1 wrought	15 50	
Bessemer billets	31 50		No. 1 cast	13 00	13 25
Open hearth	32 00		Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined		1 90	Cast borings	6 00	7 00
Light rails		37 00	Turnings	10 00	
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

PHILADELPHIA—The situation in iron and steel during the past few days was somewhat quiet. This was partly due in several cases to the impossibility of placing orders for certain kinds of material, and also the fact that consumers are pretty well covered for some months ahead. Some of the large steel concerns rolling billets, structural material, plates and bars are practically out of the market as sellers for several months. The mills and furnaces never had as much material on their books as at the present time. Bars are about the only article on the list that advanced in price during the week, but the market on everything is extremely firm, and the scarcity of material is as great as ever.

The situation in the local pig iron market is one of uncertainty, and in some respects it is causing a great deal of anxiety. Prices are wild and material is scarce. In urgent cases buyers are compelled to pay fancy prices. At present the range of prices for the standard brands of Northern iron, tidewater, delivery, would be about as follows: No. 1 foundry, $19.25 to $20 for shipments to July, and $18.50 to $19 for the last half of the year; No. 2 foundry, $18.50 to $19 and $17 to $17.50; gray forge, $17.50 to $18 and $16.75 to $17.25.

Transactions in steel billets are of very small volume, because of their continued scarcity. At the beginning of March, 1901, they were selling at $22; now they are hard to get at $32.50.

The demand for nearly all kinds of finished iron and steel is urgent, and continues on the increase. For quick deliveries sellers name their own prices. The structural mills are over loaded with work, and if new orders were entirely suspended they could run several months full time. The works engaged in rolling sheets are well booked with contracts and are away behind with deliveries. Plates are very active, but not excessively so. and the same may be said in regard to bars. The price of the latter has been advanced. Some damage and delay has been caused in some departmens by the floods. but is believed that the worst is over.

There have been no recent transactions of note in steel rails, because sellers seem unable to make deliveries. Some small lots for Central America were, however, placed this week. The price of standard sections remans at $28 a mill.

CURRENT QUOTATIONS:

Foundry, 1	$19 25	20 00	Girder rails	32 00	32 50
Foundry, 2	18 50	19 00	Angles, 3" & lr'gr		1 80
Gray Forge	17 50	18 00	Under 3-inch		1 90
Bessemer billets		32 00	T's 3" and larger		1 85
Open h'rth bil'ts	34 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

NEW YORK—Rogers, Brown & Company—Floods and disasters have been the main theme of discussion in the iron world this week. Nearly all interests in the East, and many of them in the Central West, have suffered. The high waters, not only stopped Eastern blast furnaces and mills by overflow, but what is worse, destroyed so many railroad bridges as to paralyze the railroads in the handling of coke, coal and other materials. This has compelled scores of furnaces to bank their fires for an indefinite time. The consequence is a sharp curtailment of iron output at the time of all times when it is sorely needed by consumers. As the week closes, many foundries and mills are on the verge of shut down for lack of raw material.

It is difficult to describe market conditions. How far the scarcity of iron is due to temporary causes commencing with the car famine of December and January, and how far it results from real excess of consumption over production, no man can say with certainty. It is true that deliveries of American iron this side of October are hard to secure at any price, and it is significant that the largest melters are rapidly covering for the last quarter of the year. The small price changes that are made by sellers, under these conditions, show how much better the situation is in hand than it was in 1899.

It seems inevitable that further liberal importation should be made of English and German iron. Owing to advances in prices abroad and some stiffening in freight rates, the prices at Eastern seaboard points are still above the American parity but that is not likely to prevent orders going abroad for stuff that is imperatively needed, and that cannot be supplied at home.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$17 50	18 00	Angles	2 00	2 50
No. 2X fdy Jersey City	16 65	17 15	Tees	2 00	2 50
No. 2 plain Jer. C.	16 15	16 65	Zees	2 00	2 50
Sohn. 1 fdy N. Y.	16 75		Time deliveries, basis $1.75 for angles, beams and channels.		
No. 2 fdy N. Y.	16 00		Com. base, bars per 100 lbs	1 65	1 70
No. 3 fdy N. Y.	15 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	16 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b, cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5	to 70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

CINCINNATI—There has been no change in the local metal markets the past week. Consumers and producers are looking for a solution of the problem confronting them in the shape of contracted deliveries.. A number of furnaces have instructed agents to refuse further orders and few traveling men are on the road. The reason for such action is explained by the statement that orders have been coming in at such a rate that it is necessary to stop for breath and determine how they stand on deliveries. New business the past week was comparatively light, though numerous demands are being received to hurry shipments on old orders.

Prices remain firm but unchanged. Furnaces quoting the minimum rate are practically out of the market until the last quarter of the year. Four new stacks are being put up in the South with a combined capacity of about 900 tons daily, one of which, at Anniston. Ala, will be put in blast in July.

The coke market is showing no easement either in delivery or prices. Orders for late delivery are being booked.

In finished lines prices are unchanged on large lots, with no definite time of delivery specified, excepting on steel hoops, plates and small sized bars. An advance of 15 cents per 100 pounds, plus freight rate from Chicago, was made on stock structural shapes.

CURRENT QUOTATIONS:

Bessemer	18 00	18 50	Sheets, 26 store	3 25	3 30
Fdry Nohn 1	17 50	18 00	No. 27	3 35	3 40
Northern 2	17 00	17 50	No. 28	3 45	3 50
Northern 3	16 50	17 00	Angles	1 75	
Southern 1	16 65	17 65	Beams	1 75	
Southern 2	16 15	17 15	Tees	1 80	
Southern 3	15 65	16 65	Zees	1 75	

Forge	15 15	16 15	Channels	1 75	
Charcoal	20 00	20 50	Steel melt'g scrap	15 00	16 00
Billets, Bessemer	31 00	33 00	No. 1 r. r. wrought	17 50	18 00
Bars, iron	1 85	1 90	No. 1 cast, net ton	13 50	14 00
Bars, steel	1 75	1 80	Iron rails	23 00	24 00
Rails, standard	28 00		Car wheels	17 00	17 50
Rails, light	31 00	34 00	Cast borings	7 00	7 50
Plates, boiler	1 90	2 00	Turnings	13 00	14 00
Tank	1 75	1 80			

CHICAGO—The pig iron market this week is dull, in the sense that transactions are few. Little is doing because there is next to no iron for sale, neither for prompt nor distant deliveries. A few melters who have been receiving iron faster than they could use it, on old contracts, have ventured to sell a little to needy competitors, but at a premium of perhaps $2 over the contract price. That has been about the advance for quick shipment. Consumption has been somewhat lessened because of the idleness of foundries from lack of coke, but the demand for spot iron is so lively that for every offer there are two or more bidders.

The same kind of enforced quiet applies to finished material. There is a substantial demand, but little is for sale; therefore the trade is essentially quiet. As a rule, the buyers are accepting the situation with as great comfort as the conditions can be construed to contain but where mill shipments are no longer possible the tore trade is immensely benefiting. Bars are $2 higher both from mill and from store. Sheets are a trifle firmer, plates are enjoying a moderate activity and structural material is remarkably scarce. Many of the large Western implement makers have contracted for their iron and steel material for the year beginning next July. There have rarely been placed in past seasons before Jnne. It is the famine-looking market that has led users to so long in advance anticipate their wants.

It is because of the backwardness of deliveries in mill product that scrap is so active and strong. Prices are somewhat higher than a week ago and there is a ready market for all kinds of old material. Offerings are inadquate.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$16 25	Standard Sections	29 90	30 90
South fdy. 2	14 75	15 75	Sheet, 26	3 40	
South. fdy. 3	14 25	15 25	Sheets, 27	3 50	
South. fdy. 4	13 75	14 75	Sheets, 28	3 60	
Grey forge	13 75	14 50	Angles, 3 to 6 in	1 70	
Mottled	13 50	14 50	Angles, 1¼ to 2½	1 82	
Shn. 1, soft	15 25	15 25	Beams and Chanls 15 in and under	1 70	
Shn 2, soft	14 75	15 75	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	18 10	18 60	Tees	1 75	
L. Superior, 2	17 60	18 85	Z's	1 70	
L. Sup'r char'l c w	21 00	22 00	1 wrought scrap	14 00	15 00
Hang'g r'k ccl, 1	22 00	22 50	Steel mlting stock gross ton	13 00	14 00
Sohn ccl c w	19 75	20 25	No. 1 cast	12 00	13 25
Jaksn cy, silv'y 1	18 25	18 50	Old iron rails g t'n	18 00	19 00
St'l brs base hlf ex	1 72		Old car wheels	15 25	16 00
Iron bars	1 82		Cast borings	6 50	7 00
Flange plates	1 80		Turnings	7 00	7 75
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

BIRMINGHAM—Takers of Southern pig iron are more clamorous to have orders accepted on the basis of a dollar above the quoted price, but cannot get their orders booked even under the advantageous propositions made. A leading broker states that he could sell 25,000 tons of pig iron on the basis of $13 for No. 2 foundry if he could induce the makers to accept orders. It is understood that the makers are more firm than ever in their determination not to let the market go wild or get into the hands of the speculators. Before accepting orders they must know where the pig iron is going and charge price for delivery of the iron at the yards of the consumer. A number of brokers, who expected to make thousands by buying iron for speculation, have been quietly turned down. One long-time customer of a well-known iron firm is said to have pleaded for one thousand tons of No. 2 at $13 per ton. He was finally allowed to place the order, but the stipulation was made by the manufacturer that he should pay only $12 per ton. This attitude of the manufacturer is something so novel that it has excited unusual confidence in the ability of the makers to keep the market steady. The buyers are still insistent, however, and may run the market wild yet.

The Republic Iron & Steel Company has put its rolling mill books on the same basis as its pig iron books and are declining orders on certain product for some time to come. Sales are not large in any department of the pig iron business at the present time on account of the determination of the operators not to allow speculation to enter the field for the wants of the last quarter of the year.

A good deal of coal and ore land buying is still going on and strong elements are entering the Alabama field. The Alabama Steel & Wire Company is said to be quietly at work preparing for its developments on the Bessemer and Cherokee fields, where it made large ore and coal land purchases a few days ago. The steel mill at Ensley is operating eight furnaces and quoting billets at $28 per ton. It is understood that the new rail mill will perhaps commence making steel rails in sixty days. Meanwhile it continues to manufacture one and a half inch steel billets. The metal field is so bouyant that it is without feature except its prosperity and the effort of leading forces to maintain conservative attitude.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 50	13 50	Tank	1 80	
No. 2 fdy, Sohn	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 50	12 00	No. 1 wrought	14 00	
Grey forge, Sohn	11 00	11 50	No. 1 cast	12 00	
Billets	23 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 30
Boiler plates	1 90		No. 28 sheets	$10	3 50
Fire box	2 00				

Coal.

PITTSBURG—The interest of the district is centered upon the probable early opening of the lake season, talk of which is heard since the receipt of information that the upper lake region is practically clear of ice. The miners and operators have reached an agreement upon the minor points of the scale and mining operations will not be interfered with by labor troubles, from the present outlook.

CINCINNATI—Shipments by river have been arriving the past week and the situation is much clearer. The blockade of the three main roads against coal is off and the supply from that source is better. Milder weather has had the effect of cutting down consumption. Quotations are: Nut and slack, $1.50 and $1.60; run-of-mine, $1.85 to $1.95; lump, $2.25 to $2.35, f. o. b. cars or at elevator, Cincinnati.

CLEVELAND—It is anticipated that all previous records will be eclipsed in the movement of coal on the lakes. The season will begin with the docks practially bare of coal in the West and Northwest. The first coal shipped will be welcomed at the Lake Superior ports as the Mississippi river steamers used to be welcome at river towns in the early days of spring. Labor disputes are under discussion officially with excellent prospects of adjustment.

CHICAGO—A radical change has come over the coal situation in the West. The sharp tone of prices completly melted away last week and left the market weak. Product from all the Western mines kept coming in rapidly and this week opens with the side tracks filled with coal. Eastern fuels have not yet become so plentiful, though supplies are improving. There have been many cancellations of old orders within the past few days. West Virginia coals are perhaps as scarce as any at this writing, and the demand is exceeding supply. Coke is wanted badly by the foundry trade and a considerable number of foundries have had to suspend operations for days at a time until belated cars of coke could arrive. Premiums for spot coke have been the universal rule for several weeks and the supplies do not seem to have improved as have those of steam coal.

Coke.

The movement of coke today is good but the record of the past week has been one of disaster to the Connellsville region and one of anxiety and complaint on the part of the blast furnace and foundry operators. The floods caught the coke producers just as they had found a bright streak in the clouds that hung over production but more especially shipments attending blizzard weather and the heavy snow fall. Production and shipments suffered heavily but shipments more because the effects of the weather are more diastrous to the railroad interests than the coke region as a mere producer. The snow and the floods completed the wreck of expectations but the Eastern shipments suffered most of all. The movement to Pittsburg and the Western territory was hampered considerably but not to the same extent that prevailed in the district East of Everson.

The weeks production fell from 226,465 tons to 218, 250 tons last week a loss of 8,215 tons. Shipments to Pittsburg and river points dropped froms 3,825 cars to 3,417; West of Pittsburg from 5,313 to 4,385 cars; East, from 2,075 to 1,255 cars a total of only 9,057 cars against 11,213 cars the preceding week. Shipments in tons were 200,386 tons against 248,088 tons the preceding week.

The shipments from the Masontown field fell from 525 cars to 473 last week; tonnage was 12,298 against 13,650 the preceding week, a decrease of 1352 tons. The shortage has still further enhanced the value of spot fuel but the improvement of the early days of this week and the recovery of the railroads seem to point to a much better supply of coke for the remainder of the spring. Production could be better and will be as soon as the railroads are able to meet the demand for shipments.

A summary of the Connellsville region for the week shows 20,459 ovens in blast and 827 idle.

The following figures show the scope of operations.

Production for the week	218,250 tons,
" last week	226,465 tons.
Decrease	8,215 tons.
Shipments—	
To Pittsburg and river points	3,417 cars.
To points West of Pittsburg	4,385 cars.
To points East of Everson	1,255 cars.
Total	9,057 cars.
Last week	11,213 cars.
Shipments in tons for week	200,386 tons.
" " " last week	248,088 tons.
Decrease	47,702 tons.
Masontown Field	
Shipments for week	473 cars.
" last week	525 cars.
Decrease	52 cars.
Shipments in tons	12,298 tons.
" last week	13,650 tons.
Decrease	1,352 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

The Metal Markets.

LONDON—Tin—£116 5s. £114 5s. Sales 940 tons spot; 860 tons futures.

Copper—£54 15s. £53 12s. 2d. Sales 930 tons spot; 1,525 tons futures.

Lead—£11 12s. 6d. £11 8s. 9d.

Spelter—£18-£17 15s.

NEW YORK—Tin—$27.00-$25.75.

Copper—Lake, 12⅝-12⅜; electrolytic, 12½; casting, 12½-12¼.

Lead—$4.10.

Spelter—$4.37½-$4.32½.

ST. LOUIS—Lead-$4.05.

Spelter—$4.15-$4.10.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including March 10, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS
Transit	202,754	182,666
Tidewater	63,022	29,416
Southwest	14,009	69,128
Eureka	11,885	260,333
Buckeye, Macksburg oil	791	97,952
New York Transit	96,302	1,866
Southern	212,334	....
Crescent	53,501	....
Total	654,801	589,405
Daily averages	72,772	67,263
LIMA.		
Buckeye / Indiana Local Division	474,135	392,510
Daily average	52,692	43,612

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
March 5	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
March 6	1.30	1.15	1.15	0.83	0.80	0.80
March 7	1.30	1.15	1.15	0.83	0.80	0.80
March 8	1.30	1.15	1.15	0.83	0.80	0.80
March 10	1.30	1.15	1.15	0.83	0.80	0.80
March 11	1.30	1.15	1.15	0.83	0.80	0.80

New Directory Ready.

The American Iron & Steel Association has just completed a thorough revision of its well-known Directory to the Iron & Steel works of the United States, bringing down to the closing months of 1901.

Part one, occupying 151 pages, is chiefly devoted to the presentation of a full list of the consolidations and organizations that have taken place in the American iron trade during the last few years, with a full account of the capitalization and of the properties absorbed by them, mentioning also the names of previous owners of all properties that are described. Names of directors, executive committees, and other officers are given in full. Coal and iron ore mines, coke ovens, lake vessels, railoads, limestone quarries, and all properties other than iron and steel works that have been acquired by the consolidated or re-organized companies are fully described, as are the iron and steel works themselves. Some of the older manufacturing companies of the country, which have been neither consolidated nor re-organized, are also for special reasons included in part one.

Part two, occupying 164 pages, embodies a complete description of all iron and steel works in the United States that are not described in part one. All the iron and steel enterprises in each state and district are grouped together. A complete list of recently abandoned iron and steel works, classified by states, is a feature of part one.

Part three occupies 71 pages and is devoted to the classification by states of the iron and steel works of the United States, except blast furnaces, according to their products. This classification will be found to be very convenient for ready reference.

Part four occupies 13 pages. While the directory was passing through the press in the late months of 1901 changes were taking place in the officers of many of the companies and some new enterprises noted as having been undertaken were completed. These and some other changes which had occurred prior to December 31, 1901, are fully noted so that the whole book may be regarded as complete down to the date mentioned. We have even noted some changes in officers etc., that have taken place since that date.

This edition of the directory also contains a complete account of the iron and steel enterprises in the Dominion of Canada which had been completed or undertaken down to December 31, 1901, occupying 8 pages. The names of officers, descriptions of plants, etc., are given in full detail, with proper geographical classification.

The book is ready for distribution and will be sent by mail in a strong flat envelope assuring its receipt in perfect condition. Price, $10.00 (40s) per copy.

The Pennsylvania Engineering Works, New Castle, has let contracts for several additions to the plant, which will consist of a new machine shop 84x150 feet; boiler works 65x300 feet and an electric power plant. The structural iron work will be furnished by the Fort Pitt Bridge Company, Pittsburg The latest improved machinery will be installed.

Treatment of Ore—It is sufficiently familiar to practical millmen in many departments of ore handling that there are certain troublesome features in the treatment of metallic ores which even the elaboration and refinements of modern times have not yet been able to extinguish finally. The object of this notice is to draw attention to a few natural causes which may not be fully realized by those who, having been trained in certain methods, are naturally predisposed to regard them as essentially right in principle. The particular details to be referred to are necessarily of a somewhat detached character, but will be arranged so far as possible in the order followed by the operations in which they arise, i. e., from the first rough crushing up to the final reduction to bullion.

No one who has had occasion to extend his observations over considerable tracts of mining country in various regions can have failed to note with regret the numberless instances of abandoned mills, silently recording the futile expenditure of hundreds of thousands of dollars, and only explained by the oft-told story, "It didn't treat the ore properly." Not even has a certain amount of preliminary care in mill sampling and chemical testing been always of avail to avert these misfortunes. In many cases the mill manager was supposedly inexperienced, or otherwise inefficient, and after he made one failure of it, other first-class men did not care to risk identifying themselves with a second. And so the financial stream which primarily kept the wheels turning was dried up at the source, as it too often is.

Nobody needs to be told that a mill man with a reputation for success never has to seek a job. But it is not every one who takes the trouble to ascertain clearly on what that reputation actually stands. Many people will tell you it is "luck," and doubtless that is an element in milling as in all operations connected with mining. But, however inconsistent it may sound with a work-a-day business, it may be observed that the successful mill man is usually one possessing somewhat of a sympathetic and imaginative turn of mind. That is not to say that he might have cut a better figure as a poet or musician; nevertheless, he is so far gifted with the artistic faculty that he can picture on his mental tablet some of those actions of nature, which, not being immediately obvious to the eye, are likely to escape the notice of one who has been taught to work by rule. Hence, his experience is used with greater freedom, and his capacity of experiment is not hidebound by preconceived ideas.—From "Some Unsolved Questions of Ore Treatment," in Mines and Minerals for March, 1902.

Condition of the Blast Furnaces in the United States, March 1, 1902.

Compiled for the AMERICAN MANUFACTURER AND IRON WORLD.

LOCATION OF FURNACES.	CHARCOAL. Total No. Stacks.	CHARCOAL. IN BLAST. No.	CHARCOAL. IN BLAST. Weekly capac'y	CHARCOAL. OUT OF B'ST No.	CHARCOAL. OUT OF B'ST Weekly capac'y	ANTHRACITE AND COKE. Total No. Stacks.	ANTHRACITE AND COKE. IN BLAST. No.	ANTHRACITE AND COKE. IN BLAST. Weekly capac'y	ANTHRACITE AND COKE. OUT OF B'ST No.	ANTHRACITE AND COKE. OUT OF B'ST Weekly capac'y	BITUMINOUS AND COKE. Total No. Stacks.	BITUMINOUS AND COKE. IN BLAST. No.	BITUMINOUS AND COKE. IN BLAST. Weekly capac'y	BITUMINOUS AND COKE. OUT BL'ST No.	BITUMINOUS AND COKE. OUT BL'ST Weekly capac'y
Alabama	5	2	712	3	793						39	27	26,287	12	9,240
Colorado											3	3	4,193	0	0
Georgia	8	2	720	1	125						1	0	0	1	740
Illinois											19	17	33,065	2	3,306
Kentucky											8	4	1,779	4	1,755
Maryland }	5	0	0	5	372						5	4	5,600	1	500
Virginia }											21	16	10,109	5	2,[illegible]27
Missouri	1	1	480	0	0						1	0	0	1	556
New England	7	8	286	4	360										
New Jersey						8	4	3,600	4	2,166					
Spiegel						3	3	519	0	0					
New York	8	2	710	1	75	7	2	1,800	5	2,798	10	4	5,825	6	3,530
North Carolina											2	0	0	2	[illegible]
Ohio—Eastern, Central and Northern											23	19	30,794	4	8,150
Hanging Rock District	7	0	0	7	573						11	10	6,008	1	[illegible]
Hocking Valley											3	2	800	1	[illegible]
Mahoning Valley											13	13	29,128	0	0
Oregon and Washington	2	1	100	1	280										
Pennsylvania general	8	2	75	6	506						6	5	5,673	1	1,160
Juniata and Conemaugh Valleys											15	9	13,343	6	2,[illegible]
Lebanon Valley						11	7	5,026	4	2,510					
Lehigh Valley						30	21	11,132	9	4,458					
Pittsburg district }											34	32	77,965	2	3,600
Spiegel }													2,567		
Schuylkill Valley						16	11	9,221	5	3,110					
Shenango Valley											18	15	22,394	3	4,190
Susquehanna Valley, Upper						2	1	350	1	335					
Susquehanna Valley, Lower						11	7	6,040	4	1,350					
Tennessee	3	1	82	2	615						17	11	7,247	6	3,670
Texas	4	0	0	4	865										
West Virginia											3	3	3,850	0	0
Wisconsin and Michigan	10	6	3,681	4	1,573										
Wisconsin and Minnesota											6	4	4,053	2	1,2[illegible]
Total	58	20	6,846	38	6,137	88	56	37,188	32	16,727	258	198	290,665	60	47,8[illegible]

Blast Furnaces March 1, 1902.

The following table gives the number and capacity of furnaces in and out of blast March 1, 1902:

Condition of Blast Furnaces in the United States March 1, 1902.

Fuel.	In Blast. No.	In Blast. Weekly Capacity.	Out of Blast. No.	Out of Blast. Weekly Capacity.
Charcoal	20	6,846	38	6,137
Anthracite and Coke	56	37,188	32	16,727
Bituminous and Coke	198	290,665	60	47,839
Total	274	334,699	130	70,703

Compared with February 1, the standing of the furnaces in blast was as follows:

Furnaces in Blast February 1, and March 1, 1902.

Fuel.	February 1. No.	February 1. Weekly Capacity.	March 1. No.	March 1. Weekly Capacity.
Charcoal	23	7,104	20	6,846
Anthracite and Coke	55	36,644	56	37,188
Bituminous and Coke	192	288,317	198	290,665
Total	270	332,065	274	334,699

The above comparison shows:

Decrease in active charcoal furnaces, 3.

Decrease in weekly capacity charcoal furnaces, 258 tons.

Increase in active anthracite and coke furnaces, 9.

Increase in weekly cap. anth. and coke furn's, 544 tons.

Increase in active coke and bituminous furnaces, 6.

Increase in w'kly cap. bit. and coke furnaces 2,348 tons.

Net increase active furnaces, 4.

Net increase weekly capacity, 2,634 tons.

The following tables show the anthracite and coke and the bituminous and coke furnaces in blast in the various districts February 1 and March 1.

Anthracite and Coke Furnaces in Blast Feb. 1, and Mch. 1, 1902, by Districts.

District.	February 1. No.	February 1. Weekly Capacity.	March 1. No.	March 1. Weekly Capacity.
New Jersey	3	3,123	4	3,600
Spiegel	3	522	3	519
New York	2	1,298	2	1,800
Penna—Lebanon Valley	9	6,230	7	5,026
Lehigh Valley	19	9,688	20	10,732
Schuylkill Valley	11	8,976	11	9,221
Susquehanna Val. Upper	1	397	1	350
Susquehanna Val. Lower	7	6,410	7	6,040
Total	55	36,644	56	36,78[illegible]

Bituminous and Coke Furnaces in Blast Feb. 1, and Mch. 1, 1902, by Districts.

District.	February 1. No.	February 1. Weekly Capacity.	March 1. No.	March 1. Weekly Capacity.
Alabama	25	24,098	27	26,2[illegible]
Colorado	2	2,600	3	4,19[illegible]
Georgia	0	0	0	0
Illinois	16	31,964	17	33,065
Kentucky	4	1,971	4	1,779
Maryland	3	5,500	4	5,600
Missouri	0	0	0	0
New York	4	5,771	4	5,82[illegible]
North Carolina	0	0	0	0
Ohio—East'n, Cent. & Nth'n	20	32,309	19	30,794
Hanging Rock	10	6,120	10	6,008
Hocking Valley	2	790	2	800
Mahoning Valley	13	29,059	12	29,128
Pennsylvania, general	5	5,878	5	5,673
Juniata & Conemaugh Val.	9	12,962	9	13,343
Pittsburg district	31	80,818	32 {	77,965
Spiegel	1	2,491		2,567
Shenango Valley	16	24,478	15	22,394
Tennessee	11	7,178	11	7,247
Virginia	15	9,427	16	10,[illegible]
West Virginia	2	2,633	3	3,850
Wisconsin & Minnesota	3	2,947	4	4,053
Total	192	288,317	198	290,665

MODERN STEAM ENGINE PRACTICE ABROAD.—III.

BY FRANK C. PERKINS.

The following are the results of three tests made of compound engines recently, the two first by the Belgian Steam Boilers Association, at Verviers, the third at the works of Messrs. Michelin & Cie, at Clermont-Ferrand. This latter has been confirmed several times by Messrs. Michelin and their engineers.

	I	II	III
Indicated H. P.	690	305	315
Pressure of the steam at the cylinder	7.7	6.2	7.8 at m
Steam consumption per I H. P. drain water of the cylinder included	5.36	5.46	5.34k.

Though generally the consumption increases when the pressure decreases, these three instances show the same output between rather large limits. With the compound engines, the consumption is the same between the full load and half load.

These Belgian engines are claimed to be not economical but it has been stated that tests made on several of them at 10 years of interval are about the same, which shows very little wear.

Two tests were made on the same engine by the Belgian Steam Boilers Association, the first. the 4th of July, 1890, the second the 20th of May, 1899.

	I	II
Indicated Horse Power	58.3	55.44
Pressure near the cylinder	5.12	5.23 at m
Consumption of steam per I horse power and per hour	7.85	7.98 kg

These engines need a very effective lubrication. on account of the speed of the pistons (4 meters per second.) A small centrifugal pump supplies an abundance of oil to the different parts from which it is conducted to a filter and returned to the system. The main cross head guide is supplied with a number of holes through which the oil is forced. The "Atliers Bollinckx" formerly used the crank pin in two sizes to maintain the oil as in an eccentric wheel, but this arrangment was changed as an abundant circulation of oil was found more efficient. The frame is fixed in the center and at the cylinders by means of bolts in the foundation which secures rigidity. The cylinders are fastened to the frames and lay on iron feet fastened to the foundations, which allows the cylinders to expand and contract under different temperatures without disturbing the frames or foundations. The frame is supplied with a circulation of water to avoid heating.

The cylinders are lubricated mechanically on the Mollurup system. The cylinders are made in two parts, put together without rigid joint, so as to allow the free expansion of each part. This construction allows the valve seating to be of the same density, since they are cast vertically. Ribs are formed radially around the cylinder, which increase the efficiency of the steam jacketing. The admission valves are of the Corliss type, but of a different contruction, i. e., the valve itself is a portion of the cylinder with a ridge of small height utilizing a rod upside down. The result is that in the case of near the valve remains tight. The tests have been made on engines working day and night from 10 to 12 years and have shown that the valves remain tight. The arrangement of the valve gear, it is claimed, has reduced the dead space in the cylinder to very small proportions.

The cranks are fixed upon the shaft and all the levers upon their stems by high pressure and without keys. The flywheel is also forced on the shaft by hydraulic pressure and is not secured by keys. All the pins are hardened to a depth of from two to three millimeters and are finished with the emery wheel. Those of the connecting rod have bronze boxes, but the rest are simple sockets of cast iron.

In a horizontal engine built by Ste A'e Des Ateliers Carels Freres, of Gand, direct connected to double direct current generators installed by Compangie Generale Electrique, of Nancy, this unit has also a large flywheel in spite of the fact that two generators are used, one on each side of the flywheel. Large direct current generators are

now being constucted by Lahmeyer & Company, whose armatures are so heavy and large that no flywheel is required, the revolving part of the dynamo acting as a flywheel as in the case of alernators now used so extensively with revolving field magnets.

Quite recently large slow speed direct connected engines and generators have been introduced into England on account of the increased traction business, and some of the slow speed English builders, as Musgraves, Hargraves, Galloways and Adamsons have installed some very large units, although many American engines have been installed in Great Britain for traction work. A slight variation in angular velocity during a single revolution as well as the variation of number of revolution per minute is very serious in electric traction work and great care is therefore taken in the design and construction of engines for this purpose.

At Homburg one engine drives two generators at different pressures, one for lighting and one for traction, both the dynamos being direct current machines. They differ in size and each acts as a flywheel for the other.

In a vertical engine built may by G. Kuhn of Stuttgart, operating on the same shaft an alternating current machine and a direct current machine constructed by W. Lahmeyer & Company, there is an arrangement which requires but little space, and the use of two dynamos directly coupled in this way to one steam engine, is of great advantage for central stations with mixed-current systems, as only one engine for both current systems runs nearly loaded to its full capacity for the greater part of the day. At the Wiesbaden municipal plant, there are two 1,200 h. p. slow speed engines to each of which is direct coupled an 800 kilowatt continuous current generator and an 800 kilowatt three phase alternator of the Lahmeyer type. These engines supply the necessary current for not only lighting the city of Wiesbaden from the alternating current machines but operate as well all of the electric street cars from the continuous current dynamo, no flywheel being used but perfect regulation being attained by the combination of the two systems.

In the Hanover central station there is a horizontal slow speed engine operating two generators on the same shaft, the armature of the continuous current machine and the revolving field of the three phase alternator acting as the flywheel for the engine. These generators were installed by the firm of Brown, Boveri & Company, of Baden, Switzerland. The direct current dynamo has a capacity of 450 horse power while the alternator takes 650 horse power. It is said the variation in load on the alternating and direct current and direct current machines balances the load on these engines to a very large extent. In this particular construction the alternator is on one side of the engine shaft and the continuous current machine on the opposite side, while in the Wiesbaden plant, the alternator, direct current generator, and exciter were all on one side of the engine.

It will be generally found true in looking over the modern central station plant in Germany, that the construction is high grade, that the buildings are neatly designed and solidly constructed, and that the generating plant is so arranged that the machines running at the same time work under the most favorable conditions, i. e., practically full load.

In many cases this has to be accomplished by the use of storage battery plants, which is a favorite means of taking care of the peak of the load in most German lighting plants where current is in any way available.

The largest high power engines in Germany, France, Belgium and Austria are of the horizontal, slow speed, compound and triple expansion types. The "poppet" valve gear is the most extensively used although the Collman gear is very popular, and a trip gear of some kind is almost always employed. Almost all of the alternating current machinery used in the central stations abroad consist of single or polyphase generators with stationary armatures and revolving field magnets which act as flywheels for the horizontal slow speed engines. The constancy of speed is very necessary with this class of alternators, and the angular velocity should never vary but a small fraction of a natural degree of revolution, and usually less than .8 of one per cent during one revolution.

The three phase system is largely used in Germany in conjunction with a direct current system, and if both types of machines are not operated from the same en-

gine, large alternators are used on one engine without a flywheel and the direct current machines driven by separate engines often require additional flywheels. These engines were constructed by Vereinigte Maschienenfabrik, Augsburg, and the Maschinenbaugesellschaft of Nurnber, Germany. The engines on the continent are most highly polished, and many of the parts are nickle plated giving a pleasing and bright appearance and tends towards better care of the machinery by the attendants. The engines of American make are not so well finished as the English, and the English engines have nothing like the high polish of the German and other continental engines.

Tandem compound and triple expansion engines are employed in Germany and Austria in sizes larger than 1,000 h. p. while in America the vertical types are more extensively used in the larger power plants. In the Charlottenburg plant there are three polyphase Lahmeyer alternators having a capacity of 1,100 kilowatts and two direct current Lahmeyer generators of 880 kilowatts each. This plant supplies the necessary current for about 20,000 incandescent lamps as well as the energy for operating the Berlin-Charlottenburg Electric Street Railways.

In Austria as in Germany, the horizontal slow speed engines are most frequently employed, and an example is seen in those of the Budapest power plant, which is equipped with electrical generators supplied by Siemens & Halske, of Berlin. The cylinders of the engines abroad are overhung and are supported by pedestals. These engines are of the tandem type and as usual, the cylinders are connected by a hollow casting. Many of the larger engines are steam jacketed and have vertical air pumps below the floor.

The engines in Austria as elsewhere on the continent are either nickle plated or highly polished in all of the working parts and frequently the flywheel itself is burnished. Russian steel sheathing is also employed to a very large extent.

On the continent, the triple expansion engines are largely used for both traction as well as light purposes, and superheated steam is being employed more extensively each year. Water tube boilers, with the tubes expanded into a common header, are largely installed, and the pressure at the engines is about 180 pounds per square inch, the temperature at the throttle being about 30 degrees centigrade. Superheating to 50 degrees centigrade is very common and is usually obtained by separately fired superheaters. Mr. G. A. Hutchinson, in his paper on "Superheated Steam" before the American Society of Mechanical Engineers, at Milwaukee, states that with engines of ordinary design the temperature of superheated steam should not exceed 475 degrees, Fah., at the engine, as the lubrication difficuties are greatly increased at this point. He mentions tests made by R. Doerful at Mulhausen, Germany, in which greater economy is shown with compound engines with superheated steam than with triple expansion engines and superheated steam. The superheated steam is equivalent to an increased boiler capacity, and nearly all of the foremost German boiler manufacturers offer some form of superheater. Tests are given of a 3,000 h.p. four cylinder vertical triple expansion engine of the Sulzer type, using steam, highly superheated; moderately superheated; and saturated, and the steam consumption varied from 11.75, pounds with saturated steam, to 9.56 pounds with high superheat.

In England superheated steam is not used to such a great extent as on the continent. Economizers are used much in England and in connection with compound condensing engines and mechanical stokers at the boilers excellent results are obtained. In Germany and other continental countries the mechanical stokers in the boiler rooms are scarcely used at all. The boiler room in the Budapest station shows the cleanliness of even this section of the foreign innstallation. Cooling towers and ponds are used to a large extent for condensing water abroad but are not operated by mechanical draught so largely as in this country. Mr. R. V. Picon says in an article on "Condensing Engines for Lighting Stations" in L'Industrie Electrique that the advantage of using condensing engines for electric light central stations is largely a question of the period of working under a load, because the cost of condensing may under certain circumstances exceed that of the uel which may be required in addition for the non-condensing engines.

NOTES FOR THE CHEMIST.

Determination of Manganese—L. Dufty. (Ch. News 84,248) The author proposes the following modification of Reddrop and Ramage "sodium bismuthate" method: 0.1 gm of the steel is dissolved in 2 or 3 c. c. nitric acid (1.20) and after determining the carbon, the solution is transferred to a graduated, stoppered, 25 c. c. tube and diluted with nitric acid (1.20) to 20 c. c. if the Mn. is less than 0.8 per cent or to 25 c. c. if over that per cent. A standard steel is treated in the same way, 0.2 gm. "bismuthate" is then added to each tube through a dry funnel, then shake at once and again after 5 minutes. Allow to stand in a dark place for about 30 minutes, transfer 5 c. c. of the clear pink solution to comparing tubes and dilute to a convenient tint for comparison.

Silicon in Steel—G. Auchy. (J. Am. Chem. Soc. Vol. XXIII 817-820) The author finds that by the use of aqua regia containing 3.2 c. c. sulphuric acid per gram of drillings, that the iron salt did not separate out till just before the evolution of sulphuric fumes but that the loss (due to incomplete dehydration of the silicic acid) was about the same as with the regular method. He calls attention to the old Swedish method (dilute sulphuric acid alone) and recommends it for steels high in carbon. For low carbon steels and wrought iron, hydrochloric acid should be used instead of H_2SO_4 and for pig irons, Drown's method. The following results were found on steels containing 0.15 to 0.25 per cent. Si. The loss of silicon was determined by evaporation of filtrate.

Twenty analyses by Drown's method give a mean loss of 0.019 per cent. Highest 0.034, lowest 0.010. Ten analyses, using aqua regia and H_2SO_4; give a mean loss of 0.024, highest 0.034, lowest 0.016.

Eighteen analyses with dilute sulphuric (1-4) show a mean loss of 0.004, highest 0.012, while in four of the determinations no loss was observed.

Total silicon (Si. as usual plus Si. in filtrate) by Drown's method (11 determinations) and by Swedish method (one evaporation) gave a mean difference of 0.002 per cent.

Volumetric Determination of Antimony—O. Petriccioli and M. Reuter (Jr. Soc. Ch. Industry Vol. XXI p. 73.). The finely crushed sample, ½ to 1 gm. is treated in a beaker with 50 c. c. hot water and 50 c. c. strong H.Cl, the water being added first. Heat on sand bath at 70 degrees C. for one half to one hour. Filter in large beaker or flask, washing with dil. H. Cl and water. Add tartaric acid to filtrate, dilute to about 750 c. c. heat to 70 degrees C. and precipitate with H_2S. Filter, wash with H_2S water, then wash precipitate back into precipitation vessel with the aid of hot water. The sulphide is warmed with 50 c. c. strong H. Cl (avoid boiling) until no more H_2S is evolved. The presence of H_2S is at once detected, if a little cold water be added to the solution, by the reappearance of a precipitate of red Sb_2S_3, the addition in the absence of H_2S causing only a slight milkiness, due to basic chloride. When all H_2S. is expelled, the liquid is diluted, the turbidity is removed by just sufficient HCl added drop by drop, and the solution titrated with permanganate.

$5Sb\,Cl_3$ plus $16H\,Cl$ plus $2KMnO_4$ equals $5Sb\,Cl_5$ plus $2KCl$ plus $2MnCl_2$ plus $8H_2O$.

If 5.27 gms of $KMnO_4$ be dissolved per liter of solution, 1 c. c. will equal one per cent Sb with a 1 gm. sample. The end point of reaction is sharply defined.

Cement Analysis—(Journal Soc. Ch. Industry Vol. XXI. No. 1, pages 12-30) Report of Sub-Committee on Uniformity in Analysis of Materials for the Portland Cement Industry. The report gives the complete methods by seventeen analysts for the analysis of limestones, clay and cement. The reader is referred to the original article.

Silicon in Ferro-Silicon—C. Ramorino. (Monit Scient 1902 No. 1) If ferro-silicon, rich in silcon and carbon, be directly attacked by sodium peroxide, the reaction is too violent. The action is gentle and complete if 0.5 gm of the sample well mixed with 10 gms sodium-potassium carbonates, be treated with 1 gm. of peroxide. The crucible is slowly heated and when fusion is complete, it is placed to cool on a steel plate. Treat in a porcelain dish with water and dilute HCl. Evaporate to dryness

after addition of 10 c. c. nitric acid and 2 gms, K Cl O_3. Heat residue to about 110 degrees C. take up in dilute H. Cl, boil and filter off silica.

Alkali in Cements—T. B. Stillman (Chem. Centr. [26] 1,369) The author evaporates the filtrate from the lime, with the addition of sulphuric acid, ignites to constant weight, weighs the magnesium and alkali sulphates, determines the magnesium as pyrophosphate and thus obtains the alkalies by difference.

Titration with Stannous Chloride—F. Weil. (Compes Rend 134,[2], 115). In the determination of copper, iron, antimony, sulphur in sulphides, glucose and sugar by means of stannous chloride, the titrations can be operated in cold solutions by the following method:—Into the flask are introduced 10 c.c. of the solution, 30 c. c. of HCl and some small pieces of marble. The carbon dioxide evolved expels the air, and prevents the re-oxidation of cuprous chloride, etc. When working with boiling liquids, the H. Cl evolved serves the same purpose, but the unpleasantness of working in these acid fumes is avoided by using above method.

Standard Methods for Cast Iron—(The Foundry, No. 115) The American Foundrymen's Association Committee on standards have sent out a circular letter to manufacturers and users of pig iron requesting their chemists to report methods of analysis to Thomas D. West, chairman, Sharpsville, Pa. All methods known to give commercially accurate results will be recommended as standards.

Molybdenum in Steel—Francis T. Kopp (Jour. Am. Chem. Soc. Feb. 1902). Weigh 0.5 gm and dissolve in 100 c. c. Pt. crucible with 10 c. c. water and 2 c. c. dil.H_2SO_4(*). Evaporate over burner to fumes, cool, add 30 gms fused potassium hydrogen sulphate and fuse at bright red heat(care is required in both evaporating and fusing that none of the sample be lost by spattering). Cool, treat in a No 5. beaker with 500 c. c. hot water and keep near boiling point until fusion is dissolved and solution clear. Cool, transfer to liter flask, add 100 c. c. ammonia, dilute and mix, using a dry beaker.

Allow precipiate to settle, filter on dry paper, take 500 c. c of the clear solution, and 40 c. c. dil. H_2 SO_4 and pass through a Jones reductor, add 10 c. c. dil H_2 SO_4 and titrate with potas. permanganate—450 c. c. water, 50 c. c. ammonia and 40 c. c. dil H_2SO_4 should be passed through the reductor, 10 c c. dil. H_2SO_4 added and titrated as above. The results of this blank should be subtracted from the permanaganate required to oxidize th molybdenum trioxide solution.

When 1 c. c. permanganate sol. equals 0.003053 gms iron, the factor 0.71776 will give the Mo. Cromium does not interfere with the reaction.

When tungsten is present, 1 gm sample is dissolved in a No. 1 beaker with 25 c.c dil. H. N. O_3(1.20), 10 c. c. strong H Cl carefully added and when solution is complete, evaporate to dryness. Bake to separate silica, re-dissovle in 15 c. c. H Cl, which precipitates tungsten as W O_3. Cool, dilute to 100 c. c. filter off 50 c. c., add 10 c. c. dil, H_2SO_4, evaporate to fumes, transfer to Pt. crucible; evaporate to fumes, and fuse as in ordinary steel.

For ferromolybdenum, dissolve 0.5 gm sample in Pt. crucible with 15c .c HNO_3 (1.42) Add 2 c.c. dil H_2 SO_4* and evaporate to fumes. Care must be taken to expel all nitric acid before fusion. Proceed as above.

*—The dil. H_2 SO_4 should all be 1.58 sp. gr.

Open Hearth Process—William B. Hughes, of Philadelphia, has just patented a process for the manufacture of open-hearth steel to increase production without the necessity of using furnaces of inconveniently large capacity. This he proposes to attain by premelting, outside of the furnace, oxide of iron mixed with lime to form a highly oxidizing basic slag and bring the slag into contact with the molten iron on the hearth of the furnace.

To work furnaces to their maximum capacity, and render unnecessary the use of large and expensive furnaces, the inventor expects to avoid the waste of time heretofore required for heating the basic additions by premelting the oxide of iron and lime in a separate furnace, accomplishing the removal of silicon and phosphorus without risk of injury to the hearth or lining, such as is likely to result when the oxide of iron and lime are melted in the furnace. The molten slag is said to act more

uniforlmy than if its constituents were charged into the furnace cold and in the reaction and discharge of slag the loss of uncombined oxide is prevented.

Any type of open-hearth furnace may be used, provided with means for withdrawing metal and slag, a basic-lined furnace of the tilting type, being, however, preferred. The operation is started in the ordinary way and after the metal has been properly purified by the extraction of silicon, phosphorus, and other impurities, almost all of the slag is withdrawn, and the remaining metal charge heated to the tapping temperature, at the same time properly reducing its carbon contents, making such additions as may be necessary for this purpose. Then a portion of the purified charges is withdrawn, and into the furnace is poured a proper charge of molten pig-iron, blast furnace metal, or the like, and while it is being charged, or immediately after, there is poured into the furnace the desired quantity of the highly-oxidizing liquid basic slag, the result being a quick reaction, which effects rapid elimination of the impurities and the ejection of a large amount of slag from the metal bath. This slag, or almost all of it, is then withdrawn, so that the flame can act most effectively upon the metal remaining in the furnace for the purpose of raising its temperature to the tapping point, the removal of the remaining metalloids and the reduction of the carbon contents to the required percentage being at the same time effected and additions made to accomplish this result. After the operation any portion of the finished charge is withdrawn and the operations repeated indefinitely. If preferred the entire contents of the furnace may be withdrawn, together or separately, after the completion of the process, to prevent the destructive action of the slag on the bottom of the furnace. After necessary repairs the furnace may be charged with molten pig iron or other impure metal and with the highly-oxidizing liquid basic slag the process carried on as described. To prepare the basic slag a cupola furnace is used, into which is charged the mixture of ore or other iron oxide and limestone, with sufficient coke to flux at a melting temperature but relatively so low that melting will not be accompanied by a considerable reduction of iron from the oxide, which would be objectionable. The melted slag is tapped from the cupola as required, and the cupola is of sufficient melting capacity to supply a number of open-hearth furnaces.

It is possible to carry out the invention by forming the highly-oxidizing basic slag in the open-hearth furnace by charging the lime into the surface of the bath of molten pig-iron and then pouring into the furnace the proper quantity of premelted iron oxide; but it is preferable to melt and flux together the lime and oxide in a separate furnace in the manner described.

Liquid Fuel Tests—A liquid fuel burner, which has been introduced by the Hydroleum Company, limited, High Holborn, London, England, is described in "Engineering," London. It consists of two concentric cylindrical chambers with nozzle shaped ends, and a long taper rod coaxial with the chambers. This is moved backward and forward by means of a disk wheel at the back and a screw which is inside the feeder and thus acts as a finely adjustable valve controlling the flow of liquid fuel. Steam at pressure passes into the annular chamber formed by the two concentric cylinders, and issues in an annular jet from the nozzle. The oil is contained in the inner chamber, and as it flows out around the central rod, it also is in the form of an annular stream. In this way the steam is made to surround the oil as the two emerge from the nozzle. The jet is confined within a small firebrick chamber and impinges on a firebrick placed at a suitable distance from the nozzle. The annular formation of the jet is broken up and combustion takes place. The liquid fuel is drawn through the nozzle by the escaping steam. A record was give of two tests on a 50 horse-power Nornsby water-tube boiler in which three burners were installed to overcome the emission of smoke which attended the use of coal. Test 1 was made with coke at $5.25 per ton; test 2, with the liquid fuel, which was water-gas tar, at $4.57 per ton. In the former the equivalent evaporation was 6.73 pounds of water per pound of coke: in the latter, 13.47 pounds per pound of tar.

PLATE GIRDER WEBS.

BY T. GRAHAM GRIBBLE, ASSOC. M. INST. C. E.

THE modern disposition of bridge-builders to lump material in webs does not arise from any new discoveries of science or more accurate mathematical investigations. Shearing force and bending moment were known to Stephenson and Brunel, as well as to ourselves. Although the experiments of Woehler on dynamic effect are comparatively modern, there is good reason for doubting the applicability of some of his conclusions for railway bridges; but giving them weight, they do not account for the remarkable difference between sound and successful practice of fifty years ago and that of to-day as regards the plate girder web. The most common argument for excess of materials is the liability of steel to corrosion; but it is sustained by the crooked process of assuming the applicability of the Rankine or Gordon formula for columns to a continuous web without any substantial proof, and in the face of the unanswerable witness of existing structures which, according to that theory, should have absolutely buckled and failed the first time a train went over them. Ample provision should certainly be made for corrosion, but it should be made in a rational manner, not according to the static stresses, but to the local state of the atmosphere and the degree of exposure of the various parts composing the structure. We will first examine the properties of plate-girder webs, and then the way in which the theory of construction, legitimately or illegitimately, deals with them.

A plate-girder web is a beam in itself resisting both direct stresses and shearing forces. If it had no flanges, its moment of resistance would be calculated not merely for shear, but also for the horizontal stresses of tension and compression. Its principal function in the girder is, however, to resist shear, in which it is again assisted by the flanges, especially at their ends, where the shear is greatest and where there is usually surplus material in them. To what extent this mutual assistance operates we do not know. As we have no extensometer, or other instrument capable of detecting all the molecular movements of the plastic and elastic material under stress with which we deal, we are compelled to make assumptions which shall be certainly adequate for the weakest portion of the web; but which, consequently, must provide surplus material elsewhere. Some of this waste is unavoidable, but most of it is to-day money thrown away.

A web, whether of steel or any other ductile material, is, up to its limit, elastic, and, beyond that, plastic. External forces produce during deformation moelcular currents having, like any other flow, maximum and minimum movement of particles. In a plate girder in which the web is subdivided by stiffeners into panels, there are two contrary currents in each panel, the center lines of which are the diagonals of the panel—the one a tension, the other a compression. As a geometrical necessity, the tensile flow cannot exist without inducing either a compression or a buckling along the antagonistic diagonal and vice versa. If the girder is tested to destruction, and the web happens to be weaker than the flanges, the maximum extension will be found along those diagonals which slope from the upper panel points inwards and downwards towards the centre. The antagonistic diagonals will be found shortend by a similar amount, but the material will not have measurably compressed; it will have buckled as a whole. The center of the web-panel, top and bottom, will be almost unstrained. The resistance is practically all furnished by the tension diagonal, because the other, being many times weaker, unloads its burden upon it. If, therefore, we treat the panel as no stronger that its compression diagonal, we ingore the ductility of the material.

Although the limit of elasticity may not be reached, the elastic movement probably corresponds in character with what the plastic movement would be, although not as yet clearly defined. It is probable that ordinary working stresses concentrate round the tops and bottoms of the stiffeners, acting on the rivets in the stiffeners themselves as well as those in the flange angles like a knot of stress, leaving the rest of the rivets little or nothing to do. It is also possible that the aggregate resistances in tension and compression are equal until the buckling point—not the limit of elasticity—of the compression diagonal is reached.

The horizontal shearing stress is theoretically maximum at the neutral axis. In a girder with a weak web and no stiffeners, the tendency is to buckle along a wave line near the neutral axis. When stiffeners are added, forming panels in the web, either stresses are articulated at the points of attachment, top and bottom of the stiffener and assume lines of direction along the diagonals of the panels—the one a compression, the other a tension, approximating to those of a lattice girder. As applied to plate-girder webs the assumptions of theory are all more or less erroneous, being as follows:

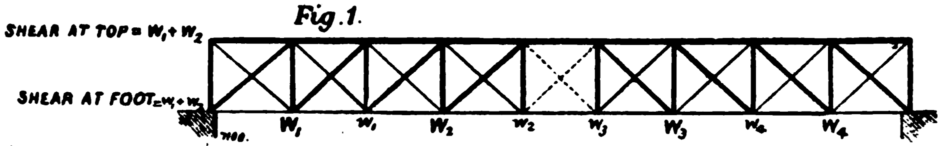
First—The web is assumed to carry the whole of the shear without assistance from the flanges. It is not feasible to extend calculation to take this assistance in to account but it is easy to find girders which have sufficient surplus flange materia to resist the end shear of themselves.

Second—The shear is assumed to be uniformly distributed over the vertical cross-section of the web and to be accompanied by an equal horizontal shear at the attachment of the flanges to the web, whereas the latter is maximum at the neutral axis diminishing in the action of the ordinates of a parabola to zero at the flanges. Failing more certain knowledge, we have to be content with this assumption, the tendency of which is to over-rivet the flange-angles.

Third—The total vertical shear is assumed to act at an angle of 45 degrees. The material grouped about the compression diagonal being the weaker line, is supposed to carry the whole of the shear leaving nothing for the tension diagonal to do. This the ductility of the material precludes. The tension diagonal as a matter of fact does nearly all the work; its resistance being from five to 20 times that of the compression diagonal. We cannot apportion these resistances but we can see the necessity for taking both into account from the following diagram.

Fig. 1 is a diagram to show the tension and compression lines in the web of a plate girder of nine square panels formed by stiffeners. Thick lines denote compression.

Fig. 1.



The load is supposed to be uniform but acting in shear as if articulated at the extremities of the stiffeners. If it were a lattice girder the end shears at the left would be equal top and bottom and composed as shown, the top shear traveling via the end tension member and the bottom shear via the compression member each of them half the total end shear. If those members were connected together at their intersection there would be some ambiguity in the stresses but the whole shear could not go one way on account of the ductility of the material. Any minute yielding of one diagonal would call in the assistance of its antagonist diagonal as a geometrical necessity. In a plate-girder web there is not merely a connected intersection, but a complete combination of strains making it inconceivable that the whole resistance should be confined to one diagonal. Although in the absence of precise knowledge we have to follow this assumption, we have here a clue to the easily observed phenomenon that girders built fifty years ago in ignorance or disregard of this assumption are as good to-day as ever they were.

Fourth—The web is assumed to resist buckling along the compression diagonal as if it were composed of a series of thin strips fixed at their ends, but deriving no assistance form the adjacent strips. This is as far from the truth as to assume that a bundle of sticks is no stronger than so many separate sticks. It is this assumption which chiefly calls for a modification of the formula.

The formulae in use in England and America to provide against buckling are partly empirical, but are based upon the experiments of Euler, Hodgkinson, Rankine, Gordon, and others on the strength of long columns. from which the well-known formula was derived—

$$\frac{P}{S}=\frac{F}{1+\frac{L^2}{36,000\,R^2}}$$

where P equals pressure which would buckle a column; S equals area of cross-section; F equals ultimate resistance to crushing of a short specimen; L equals length of column; and R equals least radius of gyration.

For a rectangular section, such as that of a web-strip, the formula becomes

$$\frac{P}{S}=\frac{F}{1+\frac{L^2}{3000\,D^2}}$$

where D equals least dimension of cross-section. When instead of the buckling pressure, a pressure which shall be safe against buckling is required, the value of F is altered to the safe working resistance to crushing of a short specimen—i. e., F is divided by a factor of safety.

The above formula is for struts and compression flanges of open-webbed girders sufficiently accurate for any structures, great or small; but to apply it to webs of place girders is almost pure imagination, and can be proved to be extravagant in the results obtained. A plate girder is, as we have seen, a composite structure in which every part assists the other, both laterally and vertically, in ways and to an extent which we have no precise formula to determine.

To analyse the Gordon formula as applied to webs, let us take a vertical strip of ⅜-inch iron plate, 1 inch wide and 90 inches high. Standing by itself as a column, the Gordon formula would allow for a material having an ultimate resistance in pure compression of 20 tons per square inch, a buckling resistance of about 7 cwt. No one would, however, like to put one-half cwt. on top of it for fear of being maimed. In its position as part of the web of a girder, the Gordon formula would give it a working resistance of about three tons. Such a strip has safely carried 60 tons shear for fifty years in the Chepstow bridge. The logic of fact is unanswerable, and a description of these girders is suggestive. It cannot be merely repudiated as out of date, because the bridge has survived many a more recently built one.

Brunel's bridge at Chepstow is a smaller example of the Satlash type. The main tubular span of 300 feet, with which we have no present concern, crosses the Wye near its confluence with the Severn. The three land spans are plate girders of 100 foot span, having tubular top booms, the lower flanges being one inch concave to allow water to drop off both top and bottom. There are no ordinary tee-stiffeners. Three gussets of 3-16-inch plate subdivide the span into four panels of 25 feet each. However much we may feel disposed to smile at the lightness of the scantling they appeal to us of the twentieth century to explain why, by our present rules, we make our girders twice, and our webs three times, as heavy to do the same duty; although we now use steel, whereas the Chepstow bridge is of iron.

Working to the Gordon formula for the unsupported length at 45 degrees of the web-plate, between the bottom of the plates of the top boom, and the top of the lower flange angles, the permissible shear would be about 5 tons total. Ascertaining, as we easily can, that the shear must be at least 60 tons, we can assume a working resistance of the wrought iron in direct compression of something less than the elastic limit, which it has plainly never yet reached. We may further assume that at least half the shear acts compressively along a diagonal line, and from these data we may synthetically reconstruct the Gordon formula as to its coefficient of buckling when applied to a web, so as to include the collateral support of the various parts of the girder. The formula

$$\frac{P}{S}=\frac{F}{1+\frac{L^2}{36,000\,R^2}}$$

was obtained by experiments upon columns with flat ends. When on pivots the fraction 1-36,000 which is dependent upon the supports or attachment of the ends, and which may therefore be termed the coefficient of buckling, is changed to 1-18,000. This is because the curve of deformation in the crippled column attains a greater radius, and there is no contraflexure. There is an evident analogy between the ratio of the strength of a fixed-ended to a pivot-ended column and that between a continuous and a supported girder. When, however, the series of columns is transformed into a continuous web, there must obviously be a modification of the coefficient to a much smaller fraction. It has never yet been determined by mathematics, but it may be shown by such an illustration as the Chepstow bridge, to be not greater than a certain figure, and in all probability much less. We have as data: (1) The shear; (2) the vertical cross section; (3) the unsupported length or depth of the web; (4) the ultimate compressive strength of wrought iron; (5) the elastic limit. We may safely say that the working factor of safety is more than 2, because that involves a strain equal to the elastic limit. It is probably at least 3, but we will take 2.5 as the least value reasonable to imagine. We will further assume that at least half the shear acts as a buckling force upon the diagonal under compression. It is probably equal to P. cross of section, where vertical cross-section is the angle made by the line of least resistance in tension with the axis of the girder. Any greater value given to either of these assumptions will still further reduce the coefficient of buckling.

Taking the ultimate and elastic limits as 18 and 9 tons per square inch respectively, which is liberal for iron half-a-century old, we find that, according to the Gordon formula, as it stands and is used, the shear which would cause the girder to fail at once is 21.8 tons. The shear which would strain it to the elastic limit, and thus cause gradual failure, would be 10.9 tons. As the shear is greater than the highest of these, the Gordon formula certainly does not measure the strength of the web.

If we admit, however, that at least 30 tons has passed, as a compression, diagonally through the web, the coefficient of buckling must be altered in the formula for a rectangular cross-section to 1-10560—and the formula will read:

$$\frac{P}{S}=\frac{F}{1+\frac{L^2}{10,560\,D^2}}$$

Seeing, however, that this coefficient of one ten thousand five hundred sixtieth is largely empirical, it would be quite near enough for practical purposes to adopt one ten thousandth.

Turning from the deep thin web of the Chepstow girder, let us now compare a small shallow web. A number of 29 feet iron girders on a certain railway carried safely for many years an end shear of 15 tons. The web is 26 inches by ¼ inch, and the stiffeners are at four feet centers. The deflections continued normal and the riveting sound. According to the Gordon formula, instant failure would take place with a shear of 19 tons, gradual failure with 9.5 tons. These two illustrations cover practically the range of plate girder construction, and prove the the Gordon formula inapplicable as it stands.

It is suggested here, and diagrams are appended to embody the suggestion, that the formula should be modified for plate girder webs to

$$\frac{P}{S}=\frac{4}{1+\frac{L^2}{10,000\,D^2}}$$

r iron; and to

$$\frac{P}{S}=\frac{5.5}{1+\frac{L^2}{10,000\,D^2}}$$

for steel. Where P is the shear, S the vertical cross-section, L the least distance vertical or horizontal between the supports of the web, and D the thickness of the plate. If desired, S may be taken as the net section, 15 per cent being deducted for rivet holes. The foregoing two examples of 100 feet and 29 feet span will now be compared when treated by some standard rules in England and America. The rules are as follows:

I—Rankine-Gordon Formula as used in England. This has just been described

II—Professor Du Bois, of Yale College, United States, for iron girders:

$$\frac{P}{S}=\frac{4,465}{1+\frac{L^2}{3,000\ D^2}}$$

The permissable shear must, however, include an allowance for impact in the form of per centage added to the stress amounting to 40—2-5 span. The value of L is the horizontal space between stiffeners, which must not exceed the depth of the girder.

III—Theodore Cooper, of New York, for iron girders—The stress per square inch must not exceed 1.785 tons, including impact provided for similarly to preceding rule. Stiffeners to be put in at spaces not exceeding the depth of the girder when the stress, including impact, exceeds

$$\frac{5.36}{+\frac{L^2}{3000\ D^2}}$$

L being the depth of the girder and D the thickness of the web.

IV—Mr. Waddell, of Kansas City, U. S., for mild steel webs—the stress per square inch must not exceed 2.23 tons, including impact. Per centage to be added for impact is

$$\frac{40,000}{500+\text{span in feet.}}$$

Stiffeners to be placed at distances not exceeding the depths of the girder. This eminent engineer apparently dispenses entirely with the Gordon formula.

V—Author's rule as previously stated—This rule is inclusive of impact. If desired to be more precise, the working stress, inclusive of impact by Woehler's formula, can be substituted for the vaule of F given in the equation.

It will be seen from the table that the best of doctors differ. Rule II is a modification of the Gordon formula only, as in the author's rule, allowing for L the vertical or horizontal distance instead of the oblique distance. Its weak point is as in the Gordon formula—the coefficient of buckling. Though not so sceptical of material as Rule I., it does not represent its strength. Rules III. and IV practically ignore the Gordon formula, and appear to be empirical rules derived from known results in fairly long plate spans, but do not allow for shallow webs what they certainly will stand safely. The ration of L:D is in Rule III merely a limit for introduction of standard stiffeners, whereas it should measure the thickness of the web. The author's rule only allows half the stress on the Chepstow girder which it carries; but times have changed, and no engineer would build as light as then. Although it allows nearly 2 tons per square inch on the shallow girder, there are numerous instances of good shallow webs working at 3 tons per square inch. All the other formulae are much too low. Finally, it is remarkable that whereas Du Bois and Cooper neglect impact at 100 foot span, Waddell adds nearly 67 per cent. We have no other formula in this country than Rankine's, English engineers do not all, nor probably do most of them, follow it. Mr. Fitzmaurice, in his handy practical book on "Plate Girders," gives as the permissible shear vertical section (deducting rivet holes) 3½ tons per square inch. He does not, however, give his formula. This, on the

Chepstow web, would amount to 98¼ tons; on the 29 foot girder it would be 17¾ tons. Quite safe, no doubt, for the small girder, but more than doubtful for the long one. Any single unit stress for web areas can be little more than a rule of thumb. We cannot dispense with some formula involving the ratio of L:D if we are to cover all plate girders.

To complete the investigation of the webs at Chepstow, the horizontal shear is 8 tons per foot run at the ends, on the usual assumption before described. The bearing pressure on the rivet holes of the flanges reaches 13 tons per square inch, and on those of the web something more. These high pressures may possibly have been developed but the absence of loose rivets seems to point rather to a defect in the theory.

A further point of interest in the Chepstow girders is the attachment of the floor, and the absence of ordinary T-stiffeners. No injury is apparent to the web from this very weak attachment. There is a very slight inwards lean of the main girders, but this is probably due more to the flange attachment than to that of the web. If we compare this attachment with the massive stiffened connections of gussets at every cross girder, holding it as in a vise, now common on some of our leading railways, we are compelled to conclude that these heavy attachments are not required to keep the girders plumb. Three gusset stiffeners in the length of any plate girder would probably suffice for that purpose. Neither can the very frequent stiffeners be really required for the support of the web. In the writer's observation, girders up to 60 ft. span stand perfectly plumb when the cross-girders are merely riveted to the bottom of the flange angles without any rivets either in the flange plate outside of the angles or in the web plate. The flange angle should be made, say, 5 inches wide. and the cross girder should rest on a bedplate, say, 16 inches long by four inches wide. by ¾ inch thick, having four rivets in the flange angle.

Numerous experiments have been made by the author upon cardboard girders having webs of weak resistance as compared with the flanges.

—	— Actual or Permissible Total End Shear in Tons. —			
	Stress per Square Inch of Vertical Section	Common 29 Ft., Girder 2 Ft. 2 In. Deep, of Wrought Iron; Clear Vertical Depth, 20 In.; Oblique Depth 28.8 In.; Vertical Sectional area, 6.6 In.	100-ft. Girder, 7 Ft. 6 In. Deep, of Wrought Iron; Clear Vertical Depth, 70 In.; Oblique Depth, 100 In.; Vertical Sectional Area, 33.75 In.	Stress per square inch of vertical section
Actual ascertained working shear, including live load, sustained without apparent detriment	tons 1.17	tons 60.0	tons 15.0	tons 2.31
Permissible shear by Rule I., F being 4 tons per square inch	0.162	5.47	4 9	0 70
Ditto by Rule II. (Du Bois) iron	0.358	11.94	7 2	1.107
Ditto by Rule III. (Cooper), iron	1.785	40.2	9 01	1.39
Ditto by Rule IV. (Wadddell). mild steel	1.34	45.2	8.2	1.26
Ditto by Rule V. (Author) for iron	0.895	30.2	15.8	2.43

In the girder, the reinforcement of the compression diagonals resulted in almost doubling the strength of the girder, and points to the best way in which an old girder might be prolonged in service where it was thought necessary to bring the web to a closer conformity to modern practice as compared with flange area. Many an old girder as been discarded solely because of the thinness of the end panels. It is also suggestive in support of the modern practice of "partwebs" in lattice girders. The buckling fold is similar to what is produced by stretching a sheet of paper by its diagonal corners in the fingers.

The buckling took place more readily with the load at the centre, or when distributed, than when the load was near the end. It required about double the shear with a load placed near the abutment to produce actual shearing, to that which would

buckle the girder in the middle when the load was central. In effect a shearing force does not shear a girder, but works in combination with torsion and direct stresses to buckle it. Diagonal lines were drawn upon the cardboard and measured, the results of extension and shortening being clearly seen.

The results of the tests, even though we are only comparing cardboad with steel, support our argument as to the Gordon formula. Cardboard is relatively as liable to buckle as any other material, its proportional resistance to buckle or shear depending upon the geometrical figure of the girder. The plain girder evidently failed much more by shear than by buckling, having about seven times the strength assumed by the Gordon formuala, and a bout two and ahalf times the strength by the author's formula. As to the over strength of the author's formula, which seems to be implied by this test, a word may be added. On referring to the analysis of the Chep. stow girder, from which the formula is synthetically constructed, two assumptions are made, each of which is purposely made to lean strongly to the side of caution. Firstly, the factor of safety at which the Chepstow girder is working is assumed to be possibly as low as 25, although this is improbable. Secondly, it is assumed that only half the shear acts in tending to buckle the end panel, similarly to an articulated lattice system, whereas it is quite possible that more than this—though not, as usually assumed, the whole of it—acts in this way. Probably it is, as previously stated, the tangential component of the stress along the angle of least resistance. If either of the above assumptions had been made more liberal, the coefficient of buckling would have been much smaller, and the result of the formula for the cardboard girder would have been the load which broke it. The author's formula would only allow on the Chepstow girder half the stress which it carries. The deflection was much greater before fracture and the crippling more gradual. The latter broke almost instantaneously when its limit was reached.

Data of Cardboard Tests—Tensile strength of cardboard: mean of ten experiments 1,690 pounds per square inch; shearing strength of cardboard; mean of twelve experiments 1,925 pounds per square inch: theoretical central breaking weight of girder, calculated from flange area; if web and flange had been made of equal strength 406 pounds; theoretical central breaking weight of girder, according to Gordon formula, by buckling of web as actually constructed 26 pounds: theoretical central breaking weight of girder, according to author's formula 72 pounds theroretical central breaking weight of girder if failure were to take place by shear alone, without buckling 294 pounds; actual central breaking weight of girder with only v rtical stiffeners 177 pounds; actual central breaking weight of girder with v ical and diagonal stiffeners 323 pounds.

Even when girders are properly maintained, they will, especially those of steel, yield to the corrosive influences of the atmosphere and rain. The degree of this effect depends, firstly, on the details of construction. Most engineers know, by sorrowful experience, the unequal struggle with inaccessible rust spaces, such as those of box girders, narrow spaces between gussets, hollows under troughs., etc. The maintenance engineer has not aways much influence upon the drawing office. Secondly, the corrosion varies greatly according to the amount of salt or gases in the atmosphere. Thirdly, the corrosion of steel is about twice that of iron.

In spite of all these adverse influences, there is no reason for huge increase of area, or for panic as to the use of steel. In the author's observation in a district liable to salt fog from the North Sea, steel girders can be maintained by painting them once in three years, but following extra thickness is recommended to provide for al contingencies.

Plates having both surfaces exposed, such as webs, gussets, endplates, etc., to be allowed one eighth inch extra. Plates having only one surface exposed, such as outer flange plates, one sixteenth inch. Plates entirely covered, such as internal flange plates, need no more than their static requirements. Lower flanges usually rust most, but may be specially protected with concrete filling.

The chief difficulties with rust spaces are at the floor attachments. The practice of leaving loose ballast over the metal is fatal. Sooner or later it becomes a sponge concealing a mass of corrosion. Bituminous concrete is no use when exposed to the sun. The best preservation known to the writer is fine cement concrete (about 4 to 1) well rammed, and coated, when not exposed to the sun, with asphalt between layers of brattice cloth.

Open Hearth Method—Another improvement in the manufacture of open hearth steel has been made by William White, Jr., of this city, which has for its object the shortening of the time required for the elimination of silicon, carbon, phosphorus, etc., from the metal and a more perfect control of such elimination.

Under usual practice it is impossible to make more than twelve to eighteen heats a week, dependent upon the percentage of silicon, carbon, etc., in the metal and the extent of elimination required. It has been attempted to employ Bessemerized metal in the open hearth process, the silicon, carbon, etc., being eliminated so far as possible in the converter and the metal transferred to the open hearth for further treatment. This has not been practically successful as the metal is too hot after treatment in the converter and the temperature is increased so rapidly by the oxidation of the silicon that it passes beyond the desiliconizing temperature before all or the desired per centage of silicon is eliminated, so that the metal when transferred to the open-hearth is too high in silicon, and the excess must be removed in the open hearth.

In Mr. White's invention molten metal at a desiliconiizng temperature is charged into a converter and blown to effect an elimination of the silicon. In the oxidation of the silicon from a fifteen ton charge containing two per cent silicon between nine and ten million heat units will be developed by the continuation of the blast for ten minutes. This heat, unless neutralized, would soon raise the metal beyond the desiliconizing temperature, i. e., to a temperature at which the oxygen has greater affinity for carbon than silicon—and that before the silicon has been sufficiently eliminated. Hence the inventor provides for maintaining the metal at a desiliconizing temperature until the carbon lines in the spectrum show that elimination of carbon is actually progressing. A convenient means of preventing an injurious or detrimental increase of temperature by the burning of the silicon consists in forcing steam into the converter with the air. It has been found that if in treating a fifteen ton charge of metal containing two per cent silicon, steam at or about one hundred and twenty-five pounds pressure be forced into a converter through a pipe one and a half inches in diameter, the metal can be maintained at a desiliconizing temperature and any desired percentage of silicon removed. As soon as all or the desired percentage of silicon has been removed the metal is transferred to an open hearth furnace by any suitable means and there treated for the removal of carbon or phosphorus or impurities by any of the usual or known methods.

It will be understood that during the latter part of the treatment in the converter the steam may be partially or entirely cut off, so that the temperature of the metal will be increased to or nearly to the point at which carbon is oxidized, so that when charged into the open-hearth furnace decarburization may proceed immediately, and there well not be any delay in heating the bath to the required temperature. As there will not be any material oxidation of the iron in the converter as long as either silicon or carbon is present, the metal will not be in any way injured by the Bessemer treament. As the metal is desiliconized rapidly in the converter and as only the carbon or a portion thereof has to be removed in the open hearth furnace, it is evident that time required in reducing the pig iron to steel will be very much shorter than in the ordinary open hearth treatment and that this shortening of the time will not produce any injurious effects on the metal.

Claims For Arsenicum—In casting alloys containing zinc the oxidation of the molten metal while being poured into the mold is the cause of many imperfections in the castings, the difficulty being so serious as to cause great loss to manufacturers

and to render many castings unfit for use. The difficulty has been attacked by a method just patented by Erwin S. Sperry, of Bridgeport, Conn.

The difficulty results from the oxidizing of the metal with a film-like surface the impurities being prevented from rising to the top of the mold by the rapid cooling of the metal. If the impurities are on the surface they cause "spilliness," which although supposed to be removed in the overhauling frequently results in scales or slivers in the finished product. If the impurities are in the metal itself, as is ordinarily the case, the lack of cohesion between the impurities and the metal causes cracks to form in the metal during rolling or drawing processes. The usual method of attempting to obviate this difficulty is to surround the molten metal while being poured with the flame of a liquid hydrocarbon, which reduces the oxide on the surface. This accomplishes the result imperfectly, as it is impossible to prevent oxygen finding its way to the metal. The requirement is for a substance that will oxidize when brought in contact with the oxygen of the atmosphere, but will leave an oxide that is not film-forming. Such a material the inventor claims to have discovered in metallic arsenic.

Arsenic has been combined with various metals in the production of alloys but for an entirely different purpose, as it materially changes the quality of the alloy. It should be noted in this invention that just enough arsenic is introduced to become thoroughly oxidized in the pouring, so that practically no arsenic remains in the finished product, it being well understood that arsenic in any appreciable quantity entirely changes the quality of an alloy, tending to give crystal line qualities, a condition followed by cracking of the metal when treated by rolling or otherwise.

The proper amount of arsenic to be introduced must be determined by experiment for each particular alloy or for the degree of heat at which it is poured. It has been found in practice that the amount required to produce the desired result varies from 0.001 per cent to about 0.25 per cent., although the latter amount is only necessary in extreme cases. For example, with "high" brass about sixty-three per cent of copper and thirty-seven per cent of zinc excellent—in fact, practically perfect results are obtained by using about 0.05 per cent of arsenic.

Our Coal in France—The first cargo of United States coal ever received at Rochelle unloaded at the basin of La Pallice, during the early part of February. This is the first installment on a contract for several thousand tons, and is to be used by locomotives.

The cargo, after its long voyage was found to be in good condition, containing, it is estimated, from 40 to 50 per cent of lumps. Accordingly, the impressions made by it are very favorable. The trials of this coal, which are not yet completed, are giving splendid results and promise to be satisfactory in every way. This lot of coal was sold to the French purchasers by an important house at Cardiff, the transaction being greatly facilitated by exceptionally low freight rates.

Samples of United States coal have several times been sent to that consular district, but have always arrived in a poor condition—containing about 80 per cent dust—which has given American coal the reputation of being extremely friable. Even with this handicap, however, the coal proved to be excellent quality.

Up to the present time, the coal supply for that region has come from Cardiff or Newcastle. On the arrival of a cargo it is carefully assorted for the various uses to which it is intended—whether for locomotive, factory, or for domestic purposes. The dust, mixed with tar, is pressed into briquettes.

The general outlook for American coal is very encouraging. A very slight diminution of price in many instances may secure important business. The quantity annually imported into that consular district is about 700,000 tons. Of this, the proportion of anthracite is small, on account of high prices. Bituminous coal, with the highest possible per cent of carbon and the lowest per cent of volatile matter, is in great demand. Prices should not exceed 23 or 24 francs ($4.43 or $4.3) per ton c. i. f. La Rochelle.

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EDITORIAL COMMENT.

Open Hearth Limitations—The outline of the patents just issued to a couple of inventors covering portions of the open hearth steel process indicate only faintly the interest in the further advancement in that department of steel production. The open hearth process has narrower limitations than is generally supposed except to those in hourly contact with the system. If the facts were otherwise there is no doubt the production of open hearth steel would be far in advance of its present position. There are points in open hearth practice beyond which it is practically impossible to move. Strictly it should be said that it is so undesirable that the practice becomes in effect impossible. Contrary to ordinary practices in steel production, the producer cannot increase his output in the same ratio by simply enlarging his furnace capacity. That is to say the producer of open hearth steel cannot increase his production to 100 tons by simply enlarging his 50 ton furnace to that size without assuming a number of risks to the furnace in addition to assuming an extra cost in production far in excess of the ratio between the two productions. The larger the open hearth furnace the greater the extra risks and relatively higher, as the capacity increases, becomes the cost of production and maintenance of furnace. In other words the large open hearth furnace is undesirable, leaving any increase in the productive capacity solely to be reckoned with through a greater number of smaller capacity furnaces. The chief difficulty and source of expense comes through the high temperatures necessary for the operation of open hearth furnaces of large capacity. The distribution of the heat always has the effect of destroying the walls and instances have been many of large sized open hearth furnaces dropping their tops during the second heat. Unless some of the latest inventions overcome the objections to large capacity furnaces the future of heavy production in open hearth seems to depend upon a large number of small furnaces.

In one of the inventions to which reference has been made an attempt has been made to overcome a part of the objection to large sized furnaces by making them virtually unnecessary by means of preheating a portion of the charge. How far this will remove the troubles in producing a greater tonnage remains for actual practice to demonstrate. The open hearth practice is waiting, even hungering, for something to remove at least some of the existing troubles incidental to large production by means of furnaces of large size. If the number of heats per life of an open hearth furnace may be lengthened from an average of say 12 or 13 up 20 as claimed by the inventor there will be a material gain in the costs attached to open hearth production. If, in addition to reducing costs by lengthening the life of the furnaces, the invention further lowers total costs by permitting a greater production, especially within a shorter than usual time for making heats, the whole gain will be one of the most substantial in the history of open hearth steel making. Thorough practice, however, can be the only test acceptable in the light of so many experiments designed to either lower costs or increase production while maintaining the same relative cost per ton for large furnaces.

Better Car Service—The improvement in the car service for the past week has begun to make its influence felt in every department of iron and steel production. The first point to bebenefitted naturally was at the blast furnaceswhic report a better stock of fuel on hand than for several months. That in its turn must act as a strengthener to the billet production and thence the good effect will be felt throughout the entire range of materials within the ensuing 30 days unless something additional in the way of disaster appears to check the advance. With a continuance of good weather conditions there is every reason to hope for a better state of affairs in every branch.

The John R. Morgan Company.

The John R. Morgan Engineering & Construction Company, recently incorporated with a capital stock of $200,000 by John R. Morgan, Edward Ackland, Thomas Johnson, Edward Johnson, Gilbert D. Preston, Philip L. Schneider, Richard E. Ackland, Robert B. Bryson and Lemuel D. Lilly, all of Columbus, O., have secured 10 acres of land in that city, and will shortly break ground for the erection of their new plant, which will be the most complete of its kind in the country. For the present the main machine shop building will be 100 by 240 feet, structural steel frame, with slate roof. The greater part of the sides will be of glass, which with the skylight provided, will make an exceptionally well lighted shop. Each of the machine tools will be driven by independent direct connected electric motors, eliminating almost entirely all belts and line shafting.

The office building will be of modern construction throughout. The basement will be fitted up with a combined dining and lecture room, kitchen, with other comforts, etc. The executive offices will be on the ground floor, and the engineering offices on the second floor. A fire proof vault will be constructed in the center of this building, extending from the basement up through the engineering offices for the use of the several departments.

The principal line of manufacture will be electric overhead traveling cranes, miscellaneous hoisting and conveying machinery of every description operated by electric, steam, hydraulic, hand and belt power. Other lines will be undertaken later.

John R. Morgan, for many years the chief engineer of the Morgan Engineering Company, of Alliance, and recently of the Case Manufacturing Company, Columbus, will have full charge of the active management of the plant. His intimate knowledge of every detail of this business extending over a period of 27 years assures the success of the new undertaking. Mr. Morgan is a member of the American Society of Mechanical Engineers, and of the Engineers' Club of Columbus. Associated with Mr. Morgan in the management of the plant, are William G. Hildebran, of Cleveland, O., who has just resigned the position of assistant secretary of the Wellman-Seaver Engineering Company, to be assistant manager of this company, and Charles F. Neuwirth, several years with the Morgan Engineering Company, of Alliance, but for the past year with The Case Manufacturing Company. Mr. Neuwirth is the engineer of the new company. The secretary, Robert Bryson, was formerly in the employ of the Case Manufacturing Company as assistant to its purchasing agent.

The temporary offices of the company are on the fourth floor of the Clinton building where a force of draftsmen are busily engaged upon the plans of the building, which will include, in addition to the machine shop, an iron foundry, structural shop, pattern shop, electrical department, and a power plant. From 200 to 300 men will be employed to begin with. The company is at present taking bids on a complete line of machine tools, engines, generators, boilers, etc.

Personal.

William A. Slick, of Johnstown went to Sault Ste. Marie, Ontario, last week to assist in the erection of mills for the Lake Superior Power Company. Mr. Slick was employed for many years by the Cambria Steel Company and is one of the best practical mill men in the country. The works at Sault Ste. Marie are being erected under the direction of David D. Lewis, formerly employed by the Cambria Steel Company.

Thomas A. Harris has been appointed secretary of the Sharon Steel Company, to succeed V. M. Delamater, who resigned about two weeks ago. Mr. Harris was formerly assistant treasurer of the Sharon Steel Company and prior to that chief clerk of the National Steel Company's plant in Sharon.

F. H. Taylor, fourth vice president of the Westinghouse Electric & Manufacturing Company, has been elected second vice-president to fill the vacancy caused by the retirement of B. H. Warren.

Archie Maxwell, former superintendent of labor at the Sharon Steel Company, has accepted a similar position with the Union Steel Company.

Technical Bodies.

A regular meeting of the Engineers' Club of Phialdelphia, was held Saturday, March 15. William Copeland Furber read an illustrated paper on "Remarks on the Recent Conflagration at Paterson, N. J."

The American Tool Works Company, Cincinnati, has plans for several changes in its plant which will materially increase the capacity. The plans provide for the removal of its offices to the five story building at the corner of Eggleston avenue and East Sixth street, which it is using as a warehouse and light machinery department. The space occupied by the offices will be used as an extension to the erecting department and additional machinery will be installed.

IN AND ABOUT PITTSBURG.

Owing to delay in getting material for the furnace plant of the Union Steel Company at South Donora and to carry plans for improvements and enlargements, announcement is made that the actual constructing work has been put off for a year. It was hoped last fall to have the big furnace plant completed this year. In the meantime, the Union Steel Company is arranging to bring to Donora and its new ore stock yard on the opposite side of the river a large tonnage of new Lake Superior ores, mostly Bessemer. The company is working its ore properties under separate charter, and vessels that will be chartered for the season to bring the ore to the lower lake ports will be given steady business during the continuance of navigation.

A company has been organized in this city by Messrs. Godfrey Stengel, Werner Kaufman and others who will erect a plant at Monaca, adjoining the works of the Colonial Steel Company, to manufacture wire and tool steel products. The above named gentlemen were recently connected with the Crucible Steel Company as sales agents, being located at Philadelphia. The plant will be built on up-to-date lines and will operate under the name of the Pittsburg Wire & Tool Steel Company. It is understood that the new company will purchase its raw product from the Colonial Steel Company. The contract for the erection of the buildings has been awarded.

Officers of the Amalgamated Association of Iron, Steel & Tin Workers, in a conference with leading operating officials of the American Sheet Steel Company, March 17 closed an agreement for the union mills of the company at work during any scale negotiation after the present scale expires, July 1. An agreement for another year after that date was arranged subject to the ratification of the Amalgamated association convention, meeting in Wheeling April 15. The agreement carries a non-interuptive clause similar to that in the scale of the Republic Iron & Steel Company, and indorses a continuance of the existing base rates.

J. Ramsey and Joseph McK. Speer and Clyde Brooks, partners in the iron and steel brokerage concern, the J. R. & J. McK. Speer Company, have organized the Speer Clay Manufacturing Company with a capital of $100,000. The new company has bought the business and plant of the Douglass-Whistler brick works, producing fire brick, and will enlarge and improve the plant for the production of high grade terra-cotta and Roman building brick.

Louis Davidson, Frederick Davidson, J. H. Cooper, F. N. Beegle, B. B. Todd, Harry Bonnell and Eugene S. Hoopes, of Beaver, and New Brighton, are applying for a charter for the Beaver Clay Manufacturing Company. They have leased the clay and coal on the farm of M. Scharff, near New Galilee, for a site for a large factory for the manufacture of fire and building brick, tile, enameled brick and other clay products.

The directors of the West Virginia Bridge Construction Company held a meeting Monday at the offices in Fourth avenue and elected officers: Edward Hazlett, president; George A. Laughlin, vice president G. E. Mincher, secretary and treasurer, and J. H. Barret, general manager. The completion of the organization will be followed shortly by the awarding of the contracts for the building of its new plant in Wheeling, W. Va.

H. S. Boller, engineer of bridges on the Pittsburg extension of the Wabash, has awarded to the American Bridge Company the contract for the construction of all viaducts that are to go in between the Monongahela and Ohio rivers. Structural steel to the amount of 15,000 tons will be used, and the contract amounts to about $1,500,000.

The National Cable Wire Company of this city is preparing to operate its new plant at Shousetown after April 1. The works is located on five acres and the main building is 100 feet by 50 feet. The foundry, 80 feet by 250 feet is operated by the North Pittsburg Foundry Company. A large reservoir, pump house, and other necessary buildings adjoin.

The stockholders of the Pittsburg Stove & Range Company at a special meeting a few days ago voted unanimously to amend the charter so that the directors could dispose of real estate belonging to the corporation without the usual legal formula of calling a special meeting of the stockholders for approval of such sale first.

It is reported that a number of Pittsburg capitalists, together with the members of the Penn Bridge Company, Beaver Falls, have formed a company with $450,000 capital, will apply for a charter and will erect a large bridge works in Beaver county.

Work on the excavations for the new plant of the Rolling Mill Company of North America, at Connellsville, is progressing rapidly and contractors on the construction of the mill buildings will begin work before long.

The United States Wire Nail Company, of this city, contemplates adding a billet mill to its plant at Shousetown. The plant now consists of three trains of rolls, one 9, one 12, and one 16 inch, and 42 wire nail machines.

No. 2 plant of the Reese-Hammond Fire Brick Company, at Bolivar, which was recently destroyed by fire will be rebuilt at once. The new structure will be practically fireproof.

Henry L. Williams, Joseph E. McGinness, William W. Dobbins, Samuel Garrison, and Daniel Ashworth, of this city, have organized the American Warming & Ventilating Company.

The Western Coal & Coke Company has been organized by Messrs. P. Keil, J. T. Keil and Roy Wise, of this city, who will make application for a charter April 4.

NOTES OF THE INDUSTRIES.

The Chateaugay Ore & Iron Company has discovered that the vein of iron ore at its mines near Lyon Mountain, N. Y., which it was supposed was thirty feet in thickness is over seventy feet and extends for six miles, making it one of the largest deposits of iron ore in the world. The company has increased its capital stock from $1,500,000 to $2,750,000 of which amount the Delaware & Hudson Company owns $1,400,000, a controlling interest. The charcoal blast furnace at Standish will be rebuilt, with an annual capacity of 25,000 tons of charcoal pig iron. Fifty new brick charcoal kilns will be built. The company will double its present output of 800 tons of ore a day.

The Green Engineering Company, Chicago, reports the following among the orders taken for its traveling link chain grates: American Tin Plate Company, 6,000 h. p.; Union Steel Company, Donora, Pa., 6,000 h. p.; American Steel Foundry Company, St. Louis; Crane Company, Chicago; Armour & Company, Kansas City; Armour & Company, East St. Louis; Armour & Company, Chicago; Cudahy Packing Company, South Omaha, repeating order; Danville, Ill. St. Ry. & Light Company, repeating order; Ballard & Ballard Company, Louisville; Emery, Bird, Thayer Company, Kansas City; Cleveland Worsted Mills; Norwood Water Works.

The Elizabeth Iron Company is a new corporation that will be announced soon. It will control the state lease to lands in section 12 near Hibbing, Minn. The company will be capitalized at $500,000. The lease which will be controlled by the company is the one that is held by J. T. Hale, J. P. Morrow, E. S. Palmer, J. T. Michaud, John G. Williams, A. M. Chisholm, and others. P. L. Kimberly, to whom the lease was recently reported sold, will be one of the outside men in the company. The lands controlled by the company's lease have been proved to contain a very large deposit of merchantable iron ore.

The Brown-Bonnell and the Bessemer plants of the Republic Iron & Steel Company, Youngstown, O., will be thoroughly modernized when all improvements are completed. The United Foundry & Engineering Company. Lloyd Booth department, has the order for rolls and parts for the two new finishing mills at the Brown-Bonnell plant; the Youngstown Foundry & Machine Company, the largest order the foundry has ever booked; the pattern for the blooming mill will be made by the Forsyth Pattern Company, Youngstown, O.

The Republic Iron & Steel Company, Youngstown, O., has awarded contracts to the Morgan Construction Company. Worcester. Mass., for three roughing trains, an automatic straightening and cooling bed, five Morgan gas producers with Bilt patent automatic feeds and three Morgan suspended billet heating furnaces. The Williams guide at the Republic plant mills will also be remodeled and contracts have been given for machinery to change into a continuous mill.

The Bessemer Limestone Company, Youngstown, O., which intends building a brick plant has placed orders for equipments as follows: Dry pans and machinery, the Bonnet Company, Canton, O., engines, Buckeye Engine Company, Salem, O., boiler equipment, Erie City Iron Works, Erie, Pa., hot air fans and engine, American Boiler Company, Detroit; kilns, T. H. Wilson, Pittsburg. Mr. Wilson will also oversee the erection of the kilns, having designed them.

The Preslar Crawley Company, manufacturers of well and core drilling machinery and friction clutches, is removing its works from Plum street to 219-223 West Second street, Cincinnati, where the output will be more than trebled. The company was recently incorporated with $30,000 capital stock and will also engage in the manufacture of special machinery. The company is in the market for a 36-inch planer and a universal milling machine.

Plans for the new 40-inch blooming mill which will be built at the Bessemer plant of the Republic Iron & Steel Company, Youngstown, O., have been completed and the work of letting the contracts will be taken up within a short time. It is estimated that the improvement will cost $50,000. In order to raise the mill to the capacity which the new mill will be capable of reaching the present converting mill is to be enlarged to twice its capacity in the installation of 10-ton convertors. Other parts will be enlarged in proportion.

The contracts for the construction and equipment of the Wheeling Glass & Novelty Company, Wheeling, W. Va. have been awarded. The factory building will be 40x40 feet, selecting room will be 40x30 feet, mixing room will be 40x40 feet, warehouse will be 40x70 feet, finishing and matching department will be 40x80 feet. The Bessemer Gas Engine Company, Grove City, Pa., will furnish the power equipment.

It is reported that a Cleveland and New York syndicate has been given an option on the Buckeye Engine Company's works, Salem, O., which was recently surrendered by Dilworth Brothers, of Pittsburg. The company has been incorporated in New Jersey, capitalized at $1,000,000. The price fixed on the plant is said to be approximately $750,000.

The property of the Austin Coal & Coke Company at Austen, three miles East of Newburg W. V. has been sold to Charles E. Bell, Washington, D. C., and Joseph E. Thropp, of Everett, Pa., who have already taken possession. It consists of 3,000 acres of coking coal with a completed plant and eighty-three ovens in operation. It is understood the purchase price is $104,000.

The output record of the Brown-Bonnell and the Valley mills of the Republic Iron & Steel Company, Youngstown, O., for the month of February was greater than any other time since the mills were built. The total output of iron for these two mills for February was 23,500 tons. This record was 77 more tons per day than any time since the mills were erected.

The Columbus Stove Company, recently organized with $50,000 capital stock, has refitted the old Eagle Foundry on West Main street, Cincinnati, for the manufacture of steel ranges and to do a jobbing business in miscellaneous castings. The company is composed of F. B. Everett, J. W. Hastings, J. C. Campbell, L. E. Jones and B. A. Welling.

Wade A. Taylor, Niles, O., Charles L. Thompson, Struthers, O., and John F. O'Dea, Youngstown, O., have organized a company with $200-000 to build a sheet and bar mill plant at Niles, where ground has been bought. The plant will contain four sheet mills, one large bar mill, and a galvanizing department. Plans for the new works are being prepared.

A force of surveyors is at work staking out the foundations for the new chain works which will be built by the Garland Company, at East Moravia, Pa., which is to be called West Pittsburg. The work of building the plant will be rushed with all possible speed, and will probably be in operation before the end of the year.

The Rahn-Mayer-Carpenter Company, Spring Grove avenue, Cincinnati, reports active demand for lathes and is operating its plant on a night schedule. The company has increased the number of sizes and has ready for the market a 30-inch lathe with new features. A traveling crane will be installed, for which it is in the market.

During the present shut down of the National steel mill at New Castle, Pa., there are a number of improvements that are being made. They include the installation of two new converters, a new bottom house, and generally speaking, everything will be entirely new that will hereafter be in use in the convering department.

The plans of the West Virginia Bridge Company, Wheeling, W. Va., are practically perfected. The stock which amounts to $500,000 has been fully subscribed. Contracts for the constructon of the building will be let as soon as the company is organized.

W. E. Taylor, Youngstown, O., who recently retired as general manager of the Republic Iron & Steel Company, with several Youngstown and Cleveland capitalists, is reported to be interested in the formation of a company for the building of an open hearth steel plant.

It is altogether likely that the Youngstown Manufacturing Company, Youngstown, O., will add a rolling mill plant to its works in the near future. The company will install one train of rolls to supply its bolt and rivet department.

The C .O. Batlett & Snow Company, Cleveland, O. has been organized. Hoisting and drying machinery, boilers and engines etc., will be made. K. F. Snow, C. O. Bartlett, I. M. Snow Jacob Hajek, M. Tappe are the incorporators.

The Standard Foundry & Manufacturing Company, Cleveland, O. may establish a branch at Hudson, near Cleveland. Informal proposals have been made to build shops there, providing the town would offer satisfactory inducements.

Machinery is being installed in the new plant of the New Castle Stamping Company, New Castle, Pa. The works are expected to be completed so that they can be placed in operation about April 1.

The Bradshaw Pottery Company, Niles, O., will soon begin the erection of two large kilns for decorating purposes at its plant. A brick building 24 by 40 feet will be added to the West side of the South end of the main building. The kilns will be located in this building.

The Louisville and Nashville Railroad has in contemplation a car building plant in Pensacola, Fla., at an estimated cost of $500,000. It is understood a tract of land has been bought by the road on which to locate the plant.

A charter was granted the C. O. Bartlett & Snow Company, of Cleveland, O., with $60,000 capital stock, to deal in machinery and supplies. The incorporators are K. F. Snow, C. O. Bartlett, I. M. Snow, Jacob Hagh and M. B. Tappan.

The Charles McCaul Company, Philadelphia, will build a one story iron hammer shop, 100x60 feet, and a rolling mill of the same material for Henry Disston's Sons' saw works at Tacony, Philadelphia.

The Direct Brick Mould Process Company, Johnstown, Pa., has been organized by F. H. Seely, George W. Griffith, E. E. Bach and W. A. Stanton. Application will soon be made for a charter of incorporation.

J. T. Francis, at Moundsville, is planning to build a general manufacturing plant for various enterprises. He wants a building 200 x 40 feet.

The John R. Morgan Engineering & Construction Company, Columbus, O., recently incorporated with $200,000 capital stock, has plans prepared for a large plant to cover ten acres of ground for the manufacture of traveling cranes.

The Bessemer Limestone Company, Youngstown, O., will erect a brick manufacturing plant to have a capacity of 75,000 brick per day. Three grinding pans will be installed.

Plans are being drawn by M. Fisher, 2146 Central avenue, Cincinnati, for a brick machine shop, 80x88, to be built in Florence avenue for George C. Kerr & Company, Cincinnati.

The Philip Carey Company, Lockland, O., contemplates the erection of two buildings to be used as pipe covering and roofing departments.

Fire destroyed the core room and foundry departments of the Novelty Iron Company, Canton O, a few days ago causing a loss of about $70,000.

No. 2 blast furnace of the E & G. Brooke Iron Company, at Birdsboro, Pa has been put in blast after being thoroughly remodeled.

The Link-Belt Engineering Company, Philadelphia, is adding a two story brick addition, 42x90 feet, to its works.

The Beaumont Glass Company, Martins Ferry, O., has decided to remove its plant to Grafton, W. Va.

The Hill & Griffith Company will ship this week five carloads of foundry facings and equipment to Dallas, Texas.

The National Iron Company, Gettysburg, Pa. has been granted a charter with a capital stock of $125,000.

The Angola Furnace Company, Angola, O. has plans prepared for a new foundry.

The Keystone Drop Forge Company will erect a plant in Chester, Pa.

WEST VIRGINIA NEWS.

The new West Virginia Bridge & Construction Company of Wheeling, has formally organized, electing Edward Hazlett president; George A. Laughlin, vice president; G. E. Wincher, secretary-treasurer, and J. H. Barrett, of Pittsburg, general manager. Mr. Barrett has plans already drawn for the company's works three miles above the city. The project is backed by a capital of $500,000.

Judge Nathan Goff has ordered the construction, at Clarksburg, of a three-story business block. The buildings will be 70x70 feet and be used for business and manufacturing purposes.

The Wheeling Steel & Iron Company, at Benswood, has ordered a large number of its tenant to vacate company property which is to form the site for extensive additions to the mill.

The Iron City Engineering Company, Pittsburg, has secured the contract for an electric light plant at the Pruntytown, W. Va., reform school. The Mountain State Electrical Company, Wheeling, got the contract for wiring and fixtures. On April 8, the board will award other contracts for additions and improvements to school buildings.

The Fairmont Gas & Light Company, $150,000 capital, has been organized by S. L. Watson president, and others. The company will lay pipes and install a large plant this coming summer.

The Garrett Water & Light Company, with $25,000 capital, has been formed to put in a water system and large light plant at Mt. Lake Park. L. A. Rudisell, of Mt. Lake Park, is secretary.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

PITTSBURG—A better movement of cars has put more activity into the markets and the freedom is beginning to be felt although the improvement is only of a few days' duration. For the first time in months the blast furnaces report a satisfactory situation in the fuel conditions. Better returns in pig iron are made which will put the raw materials more at ease than they have been for some time. The situation is not in such condition that strong relief has been felt through the change, but the feeling is perceptibly better. With the existing conditions maintained for another 30 to 60 days the whole situation will experience an ease that seemed impossible a month ago. The efforts that have been making for several months tending toward an improvement in iron and steel running from transportation to the finished steel products are beginning to bear fruit. The gain in the number of active cars and locomotives cannot but influence the trade toward a heavier output of every material which is all that is needed to reduce the extraordinary pressure and minimize the dangers of the case.

Market conditions are practically unchanged in every branch of production. New business remains outside the breast works but prices are held at the nominal quotations. No material is moving except on specifications notwithstanding reports to the contrary. At the same time some prices are likely to be advanced soon. Among them are bars and skelp. The nominal quotations on bars remains at a base of $1.60, Pittsburg, but reports are numerous of bars going for as high as $1.80. Sales at $1.70 are frequent. Muck bar is quoted this week at $32 per ton at mill which may be higher within a week. Iron skelp is quoted at $1.90 and $1.95; steel, $1.80 and $1.85 which is almost certain to be 5 and 10 cents higher by the beginning of next week.

In pig irons the only basis is the nominal quotations and even they have no meaning now. The prices on iron are what the producer asks, for consumers are willing to pay any rate. Mill iron [illegible] another 25 cents per ton this week, sales having been made during the week at $16.-[illegible] Bessemer is good for any price up to $18 at [illegible] furnace. The price quoted is that at [illegible] the regular production is going to con-[illegible] [illegible] of those caught in the rush una-[illegible] get what they need.

CURRENT QUOTATIONS.

[illegible]	[illegible]		[illegible] bars	1 [illegible]	
[illegible]		[illegible]	[illegible]	1 [illegible]	
[illegible]	[illegible]		[illegible]	1 [illegible]	
[illegible]	[illegible]		[illegible]	1 [illegible]	
[illegible]		[illegible]	[illegible]	1 [illegible]	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill iron	16 50		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 60	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	14 00	
Gray Forge, Shn	15 60		No. 1 wrought	15 50	
Bessemer billets	31 50		No. 1 cast	13 00	13 25
Open hearth	32 00		Iron rails	21 50	
Steel bars	1 50		Car wheels	17 50	18 00
Iron bars, refined		1 90	Cast borings	6 00	7 00
Light rails	-	27 00	Turnings	10 00	
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—The market for iron and steel stands just about as it has been for some weeks past, and with furnaces and mills sold up for months ahead and a heavy demand for material that shows no signs of abatement, present conditions are certain to continue for some time to come. Furnacemen and a large number of consumers are exerting every effort to hold the market level, but in spite of this prices give every indication of an advance on some lines. No large transactions were made in pig iron during the past week, but it is thought that considerable business will be done in this line, for delivery during the last quarter, before long. There continues to be a scarcity of steel, but there is no information of additional business being done abroad. Finished iron and steel products are very active, and many of the mills have all the business they can take care of for at least six months.

The local pig iron market is very firm, but not specially active, as there is very little iron for sale. Consumers are buying all they can get, but the greater portion is on contracts made some time ago, although some is on recent puchases, as old contracts are running out pretty rapidly. New contracts for long deliveries are difficult to negotiate, as makers are not inclined to book any more orders at their nominal prices, and consumers are equally unwiling to pay advances. For prompt shipment the situation is different, and almost any price would be paid for iron that could be delivered within the next month. Nominally the range of prices for the standard brands of Northern iron, tidewater delivery, is about as follows: No. 1 foundry, $19.25 to $20 for shipments to July, and $18.50 to $19 for the last half of the year; No. 2 foundry, $18.75 to $19.25 and $17 to $17.50; gray forge, $17.50 to $18 $16.75 to $17.25. There is really no market in steel billets. Nominally $32.50 to $33.50 is about what sellers would accept if they had any steel for sale, but they all claim to be filled up with orders for the balance of the year.

Business is active in all the manufactured iron

and steel departments. Some are more busy than others, but there are none that can be called dull. Structural material is almost beyond reach, and it is impossible to buy anything in this line at what are called official quotations. An interesting event of the week was the placing of a contract by the American Bridge Company for 35,000 tons of angles with the Bethlehem Steel Company which will use its own open hearth steel, rolling the angles on the former rail mill. This is expected to relieve the pressure in angles, which has been very acute for some time past. Sheets appear to be getting scarcer every day, and it looks as though the mills would be unable to meet the demand except subject to considerable delay in deliveries. Steel bars are also very scarce, but iron bars and plates can be delivered almost as in ordinary times.

The market for steel rails is quiet. It is reported that some foreign rails have been imported by merchants. Standard sections continue to be quoted at $28 at mill.

CURRENT QUOTATIONS:

Foundry, 1	$19 25	20 00	Girder rails	32 00	32 50
Foundry, 2	18 50	19 00	Angles, 3" & lr'gr		1 80
Gray Forge	17 50	18 00	Under 3-inch		1 90
Bessemer billets		32 00	T's 3" and larger		1 85
Open h'rth bil'ts	34 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown & Company: The market for pig iron, and indeed for most finished forms in the larger lines is one of futures. This side of July it can practically be said that there is no market. Furnaces have sold their product and most buyers have covered. Besides this, more than half of the capacity for the last half of the year is sold.

Market questions, therefore, center around the point of what consumers think of next fall and winter. The rapidity with which the unsold remnant is being taken up indicates how most buyers look at it. There are others, however, well informed and of large experience, who have never been accustomed to provide for wants so far ahead, and prefer now to wait and take their chances. They reason that furnace product will be sensibly increased when we are through with storms, floods and car famine. They feel also that accidents may happen, such as financial backsets, crop failures, etc., which may check new enterprises and restrict consumption.

A fresh impetus has been given to foreign importations of pig iron by the increased scarcity along the Eastern seaboard, and further negotiations are now under way. The few thousand tons which have been brought in have been quickly taken in by large consumers. Importation prices are still above domestic, but that cuts little figure under the circumstances. The conservative spirit still prevails among the furnaces that are holding prices about where they have been for the past two weeks for such offerings as they can make.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$17 50	18 00
No. 2X fdy Jersey City	16 65	17 15
No. 2 plain Jer. C.	16 15	16 65
Sohn. 1 fdy N. Y.	16 75	
No. 2 fdy N. Y.	16 00	
No. 3 fdy N. Y.	15 50	
No. 1 soft	16 75	
No. 2 soft	16 00	
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40
Sheets, blue annealed, 10	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00
Plates ¼ and heav	3 15	
Ship & tank plate, on dock	2 50	2 50
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10	
Beams and chan'ls 15-in & under	2 00	2 50
Angles	2 00	2 50
Tees	2 00	2 50
Zees	2 00	2 50
Time deliveries, basis $1.75 for angles, beams and channels,		
Com. base, bars per 100 lbs.	1 65	1 70
Refined base, bars	1 85	1 90
Bands, base	2 40	2 50
Norway bars	3 75	
Norway shapes	4 25	
Old T rails, iron f. o. b. cars	20 00	21 00
T rails steel f o b c	16 50	17 50
No. 1 wro't scrap iron f o b cars	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes	13 00	14 00
Old car wheels, f. o. b. cars	16 00	17 00
Old ham. car axl's f. o. b. cars	22 00	23 00
Wrought turnings deliv. at mill	11 50	12 00

CINCINNATI—The situation shows little change since the last report. A fair number of orders are being booked for late delivery and a number of orders specifying early delivery are being turned down. It is a strong sellers' market and those badly in need of iron for early shipment are experiencing considerable trouble in securing even a small part of their requirements.

A few small lots of foundry iron were sold the past week at an advance of from 75 cents to $1 a ton over the market price. Minimum quotations presented are merely nominal and apply only to delivery during the latter part of the year and the first of next year. Sales of Bessemer, charcoal and foundry irons for late delivery aggregate a good tonnage. Southern furnaces are in much better working order and cars are more plentiful with the appearance of moderate weather. There is a difference of from $1 to $1.75 a ton in the views of sellers as to the market price. One large interest is quoting a minimum price of $1 a ton over the minimum price here presented.

Coke is moving in heavier volume than for some time past, but the demand continues to exceed the supply and prices remain firm. The demand for finished material shows no falling off. Local sales department of large mills report the situation more complex than at any time in the history of the business. Each day orders are taken with the understandng that no specified time of delivery can be given. The demand for iron and steel from store is strong and prices have been advanced from $2 to $4 ton on small lots.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$16 75
South fdy. 2	14 75	16 25
South. fdy. 3	14 25	15 75
South. fdy. 4	13 75	15 25
Grey forge	13 75	15 00
Mottled	13 50	15 00
Shn. 1, soft	15 25	16 75
Shn 2, soft	14 75	16 25
L. Superior, fdy. 1	18 10	18 75
L. Superior, 2	17 60	18 25
L. Sup'r char'l c w	21 00	22 00
Haug'g r'k ccl, 1	22 50	23 00
Sohn ccl c w	20 35	20 60
Jaksn cy. silv'y 1	18 35	18 60
St'l brs base blf ex	1 72	
Iron bars	1 82	
Flange plates	1 80	
Tank steel	1 70	
Ordinary fire-box.	1 90	
Light rails	39 00	
Standard Sections	29 90	30 90
Sheet, 26	3 40	
Sheets, 27	3 50	
Sheets, 28	3 60	
Angles, 3 to 6 in.	1 70	
Angles, 1¼ to 2¾	1 82	
Beams and Chanls 15 in and under	1 70	
I b'ms 18, 20 24 in.	1 80	
Tees	1 75	
Z's	1 70	
1 wrought scrap	14 00	15 00
Steel mlting stock gross ton	13 00	14 00
No. 1 cast	12 [illegible]0	13 25
Old iron rails g t'n	18 50	19 50
Old car wheels	15 25	16 00
Cast borings	6 50	7 00
Turnings	7 00	7 75

CHICAGO—The large implement makers and other manufacturers who consume finished iron and steel, have been lively buyers during the past week. The aggregate business placed for the month of March to date, of this description is said to have been the largest on record for the same period of time. The purchases made are for wants extending from July 1902 to July 1903, or a portion of that fiscal or business year. Both iron and steel bars have been bought in heavy lots, the aggregate probably exceeding 150,000 tons. In a modified way, other finished products, merchant eel, sheets and plates, were shaded in the act vity. Business in rails is confined to small lots. Structural shapes are not procurable though the inquiry is of a large and insistent variety. Store stocks have been severely raided since the mills ceased to accept orders.

Pig iron is moderately active. There are few sellers, the large producers having almost entirely withdrawn from the market. Small furnacemen in various parts of the country, not usually tributary to this market, are sending in small lots of iron which find a ready sale, but spot iron continues far beolw the requirements. Prices are somewhat higher, though the range of values is irregular.

For all kinds of old material the inquiry exceeds supply. Here too the line of prices is wavering more than usual and often advance rather sharply under the persistent demand. Receipts of scrap are increasing and occasionally the holder lets go at a slight sacrifice but on the whole it is a decidedly strong market.

CURRENT QUOTATIONS:

Bessemer	18 50	19 50
Fdry Nohn 1	18 00	19 00
Northern 2	17 50	18 50
Northern 3	17 00	18 00
Southern 1	16 65	17 65
Southern 2	16 15	17 15
Southern 3	15 65	16 65
Forge	15 15	16 15
Charcoal	20 00	21 00
Billets, Bessemer	31 00	33 00
Bars, iron	1 85	1 90
Bars, steel	1 75	1 80
Rails, standard	28 00	
Rails, light	31 00	34 00
Plates, boiler	1 90	2 00
Tank	1 75	1 80
Sheets, 26 store	3 25	3 30
No. 27	3 35	3 40
No. 28	3 45	3 50
Angles	1 75	
Beams	1 75	
Tees	1 80	
Zees	1 75	
Channels	1 75	
Steel melt'g scrap	16 00	17 00
No. 1 r. r. wrought	18 00	19 00
No. 1 cast, net ton	14 00	15 00
Iron rails	23 00	24 00
Car wheels	18 00	19 00
Cast borings	7 50	8 50
Turnings	13 00	14 00

Coal.

PITTSBURG—One change in the rates in effect last year was made at the joint meeing of the Ohio and Western Pennsylvania Railway Traffic and the Eastern Ohio Coal Traffic associations last Saturday. This change increases the rates from Ohio mines to the lakes f. o. b. vessels from 75 to 77 cents a ton. Other rates are unchanged from last years schedule as follows:

Pittsburg district coal, 73 cents a ton, f. o. b. cars at lake ports; fuel rate, 80 cents a ton at ports; commercial rate, 90 cents; Chicago rate, $1.75 a ton.

West Virginia—The same differential of 8¼ cents above the Pittsburg rates is maintained. The rate of $1.75 a ton will be maintained from the Fairmont, Kanawha and Thacker districts. From the New River and Pocahontas districts the rate of $1.90 a ton is adopted. This $1.90 rate applies also to Altoona and Cumberland shipments.

Ohio—Lake rate 77 cents a ton; Chicago rate (for the present at least), $1.50. A change in the Chicago rate may be made later.

CLEVELAND—The action of the traffic managers in settling the coal rate for the coming season at last year's figures in all respects except to add two cents from Ohio mines to the lakes f. o. b. vessels bringing the new charge up to 77 cents, will have the tendency to enliven the interest in the approaching opening of the lake carrying season. The interest in the ore situation has its effect upon the coal trade, as, if the vessel men maintain their threat to hold out against the Steel Corporation in the matter of ore, the availability of boats for coal carrying will make a big difference from both sides of the case. However, it is generally believed that there will be an amicable adjustment of the situation before the freight begins to move in volume.

CINCINNATI—The stock of coal in the local market is by no means large, and there is a very peculiar situation that coal men have not experienced in some time. Notwithstanding the fact that there is plenty of water in the river, there is not as large an amount of coal loaded at the headwaters as is usually the case when there is an opportunity for making a run. If the river continues falling it will be much easier to get back with empties but there will also be some danger that the river will get too low again to allow the boats to come down with loaded barges. For this reason the coal men are not a little worried. This is the time of year that the coal companies generally lay in their stocks for the summer and fall, and, if they should fail to get in any supplies they would find themselves in something of a bad way. Some

river coal was received here last week, but not so much as was wanted.

Quotations remain unchanged: Nut and slack, \$1.50 and \$1.60; run-of-mine, \$1.85 to \$1.95; lump, \$2.25 to \$2.35, f. o. b. cars or at elevator Cincinnati.

CHICAGO—The cold weather this week was a godsend, in that it permitted the sale of a large quantity of fuel which for several weeks had been accumulating on tracks in this city. Late last week the market for steam coals had become exceedingly depressed, due to the forced sale of coal by reason of demurrage charges, imposed or threatened. Eastern coals had not yet accumulated sufficiently to weaken prices but the pressure for coal had been somewhat relieved. Ohio product had, however, fully regained a normal supply and might have grown heavy had not the colder temperature resulted. The closing of contracts for the new season, beginning April 1 or a little later, has not developed much headway and the impression appears to exist that business of that character will be slow for some time, owing to the already developed weakness of Western fuels, which last week could be purchased at the low summer basis. Users can thus buy free coal fully as cheap as they could hope to buy on contract. Coke is very scarce and premiums continue the rule.

Coke.

The operations in the Connellsville coke region for the past week were much improved over the preceding weeks in the matter of shipments but the aggregate production did not show the same gains. The work at the ovens is still hampered by the piling of coke and other causes due directly to the congestion of product and scarcity of cars in conjunction with the unusual weather conditions. Production failed to reach the figures of the preceding week but the substantial gains made in the movement of fuel in all directions more than compensated for the failure to show improvement in production. The production fell off 839 tons for the week but shipments rose from 9,075 cars two weeks ago 11,650 cars for the past week. In tons the gain for the week shipments was 57,354 tons.

The greatest improvement was made in the Western shipments, the points West of Pittsburg recording 6,223 cars against 4,385 for the preceding week. The points East of Everson made a gain of some 500 cars. Pittsburg made a gain of 384 cars.

The greater relative gain made in shipments over production for the week lay in the fact that there was a large number of cars loaded in the region waiting for shipment when the report for the preceding week closed and all of that product went over into the past week. Another point is that the car supply for the week under review was materially better and permitted the heavier movement of coke. The operators are beginning to remove the piles of coke that are to be seen everywhere throughout the Connellsville region and if the car supply continues strong as for this week the blast furnaces and foundries will have a comparatively full supply of fuel for the first time since late last summer.

A summary of the Connellsville region for the week shows 20,459 ovens in blast and 827 idle.

The following figures show the scope of operations.

Production for the week	217,401 tons.
" last week	218,250 tons.
Decrease	839 tons.
Shipments—	
To Pittsburg and river points	3,701 cars.
To points West of Pittsburg	6,223 cars.
To points East of Everson	1,726 cars.
Total	11,650 cars.
Last week	9,057 cars.
Shipments in tons for week	257,740 tons.
" " " last week	200,386 tons.
Increase	57,354 tons.
Masontown Field	
Shipments for week	467 cars.
" last week	473 cars.
Decrease	6 cars.
Shipments in tons	12,162 tons.
" last week	12,298 tons.
Decrease	136 tons.

Coke Prices.

Pittsburg—Furnace, \$3.25@3.50. Foundry, \$3.50@3.75.

St. Louis—Connellsville, \$5.25@5.50. West Virginia, \$4.25@4.50

Cincinnati—Connellsville, \$5.00@5.25. Kanawha, \$4.60 Stonega, \$4.60

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10 c
Copper, light bottoms	8 c
Heavy Composition	9 to 10½ c
Brass Turnings	6½
Heavy Brass	7 to 7½ c
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	\$3.00
No. 1 Pewter	16

Tin Plate.

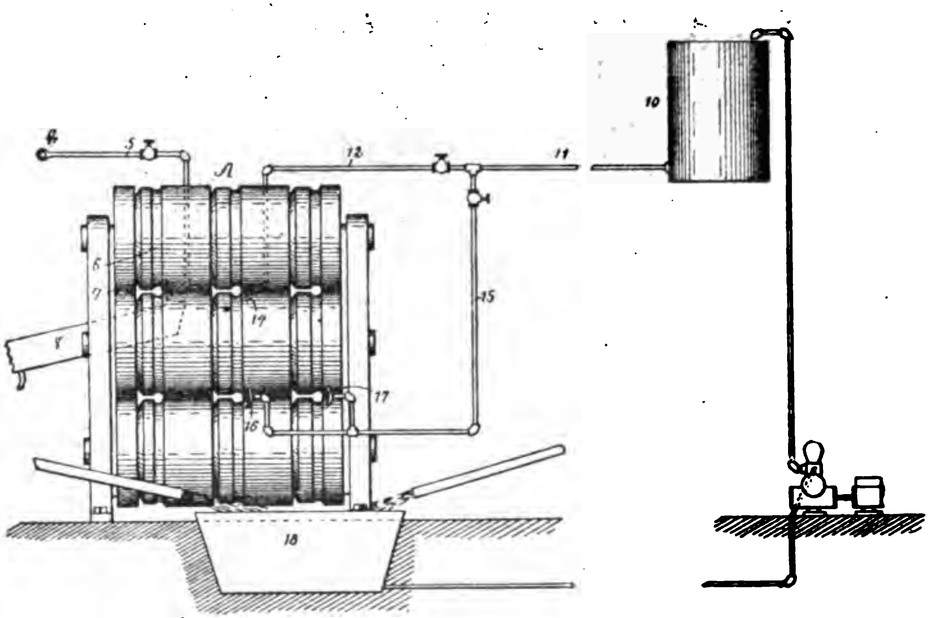
American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	\$4 50
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at \$4.25 for full weight 14x20; \$4.10 for 100 lbs.; \$4.05 for 95 lbs., and \$4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, \$4.90 Bessemer Steel, 100 lbs. \$4.75.

Treating Rails In Rolling—The accompanying drawing illustrates the application of the patent granted to W. E. Coyan, Homestead, November 15, 1901.

The object is to temper and harden steel shapes. In the figure, A shows the finishing rolls through which a steel rail is supposed to be passing. In the present method for rolling rails the finishing is done at a high temperature and then the rail is allowed to cool undisturbed. As the rail is heavier at the head than the web, irregular strains are produced which weaken the rail. Another defect is the porous structure of the finished rail which seriously affects the wearing qualities of the head. In the figure, 4 is a water main, 5 is a branch pipe leading from that main and terminating in a head opposite the rail head at 7. As the rail passes through the finishing rolls a jet of water is thrown against the head which chills it and so tempers the rail. The water, after leaving the rail, flows into the trough 8, and is conducted away until finally it reaches trough 18. Ten in the figure is supposed to be an oil tank connected by pipes with a similar arrangement in case it is desired to use oil for tempering the rail.



Coyan's Treatment to Temper Rails.

The Metal Markets.

LONDON—Tin—£116-£114 5s. Sales, 520 tons spot; 840 tons futures.

Copper—£54 10s-£53 7s 6d. Sales, 725 tons spot; 1,350 tons futures.

Lead—£11 10s- £11 8s 9d.

Spelter—£17 15s.

NEW YORK—Tin—$26.75-$26.50.

Copper—Lake. 12⅛; electrolytic, 12⅜; casting 12⅜-12¼.

Lead—$4.10.

Spelter—$4.37½-$4.32½.

ST. LOUIS—Lead—$4.05-$4.

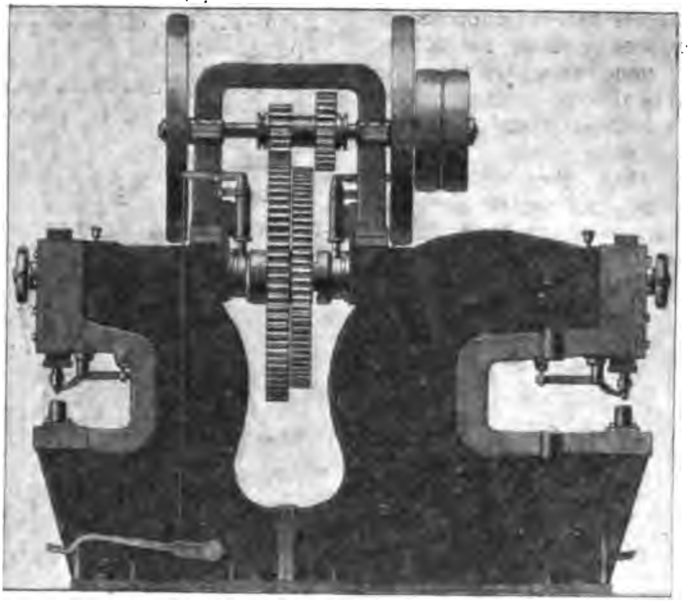
Spelter—$4.10-$4.07

Trade Publications—The Cincinnati Milling Machine Company, Cincinnati, O., has just issued a late catalogue showing a new line of milling machines. This is a very handsome piece of bookwork, with illustrations in half tone throughout. A number of interesting improvements are illustrated and described in detail; among them the company's new all-gear feed mechanism, whereby all feed changes are instantly obtained by movement of lever, the drive being always positive, permitting much heavier and faster cuts than the old belt-fed mechanism.

Swift & Company, Chicago, have secured property at Clarksburg upon which will be erected a large storage house complete with ice machinery, etc.

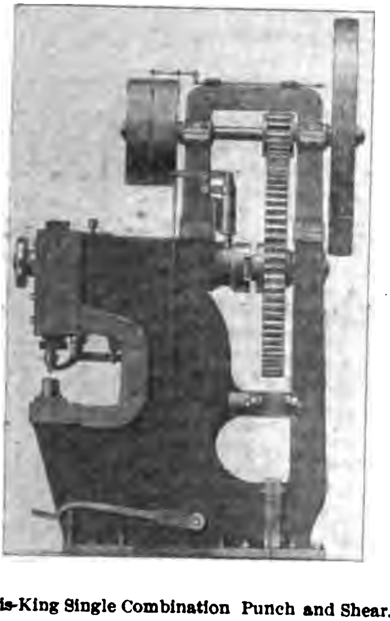
An air-brake and repair shop is being installed at Benwood Junction by the B. & O.

Improved Punch and Shear.—The illustrations presented show a single and double combination punch and shear, manufactured by the Wais-King Tool Company, Winton Place, O.



Wais-King Double Combination Punch and Shear.

The machines are built for an overhead belt, n order to save room and allow material to be handled to and from to better advantage. The single machine is shown single geared, but the double or change gear can be readily applied. Where the machine makes 25 strokes on heavy work by means of the extra gear, 45 strokes can be made on lighter material with the same belt speed.



Wais-King Single Combination Punch and Shear.

The double machine illustrated is shown double geared, one throat 12 inches and the other 24 inces, the small pinion being engaged for heavy work. Both pinions are keyed on the sleeve to work in harmony so that when one is placed in gear the other is moved out of gear by means of a lever. Each machine is provided with an automatic clutch, on which patents are pending, which can be set to different thicknesses of material and which automatically stops the punch above the material; allowing the operator to set his work before punching. The larger machines are made with molded gearing and the smaller ones with cut gears. All crank-shafts on the main bearing as well as the pendulums are bushed. With each machine a set of punching and shearing tools is furnished.

The Flemington Coal & Coke Company, at Flemington, W. Va., operated by New York capital, has announced that it will open and equip new mines. The improvements will require several months to complete.

The Enterprise Enamel Company, Bellaire has let contracts for another addition to its works, 100 x 80 feet.

Metal Pouring Ladle—Ladles for pouring molten metal have heretofore been constructed of rolled metal throughout, that is, both the body portion and bottom have been constructed of rolled metal, lined with the usual fire brick or clay. Serious difficulties, however, have been encountered in the use of these ladles resulting not only in loss of time, but in the loss in some cases of an entire pouring of metal, entailing great expense. This is due to the warping, bulging, or cracking of the rolled metal bottom, occasioned by the intense heat and weight of the molten metal. When the bottom warps, bulges, or cracks, it displaces the refractory lining of the ladle and allows the molten metal to come in contact with the bottom. In some cases the bottom is burned out, causing the loss of the ladle contents. This necessitates the replacing of the bottom. To overcome these difficulties, Frederick Baldt, of Chester, Pa. has devised a ladle the bottom of which will not warp, crack, or bulge and has used such a ladle for some time with satisfactory results.

The body portion is formed of rolled metal, while a removable bottom is constructed of cast metal secured to it, for instance, by bolts. The properties of the cast metal bottom are such that it obviates the objections to the rolled metal bottom, it does not warp, bulge or crack when subjected to the intense high heat and weight of a full ladle of molten metal, so that the refractory lining of the ladle is not misplaced. An advantage is secured in the cast metal bottom since the life of the ladle is prolonged, and a new bottom can be quickly inserted when necessary. As the bottom is in part subjected to the greatest heat and strain it is necessary to make it exceedingly strong and durable, combined with the approved weight and property of resisting any tendency to warp or bulge. The properties can be secured by the present construction, preventing the bottom from sagging, bulging, or cracking.

Horiz. Cyl. Form. Special Design.

COCHRANE HEATERS.

It is a pleasure to us to quote prices on COCHRANE HEATFRS, not so much because we hope and expect to get the order, and from the profit thereon pay some portion of what it costs us to live, but because we have the feeling that the price is RIGHT, that we are undertaking to furnish apparatus well worth the money from manufacturing and commercial standpoints, and that this apparatus is going to prove a money-saver, a labor-saver, and a most profitable investment for any steam power plant.

We also know in advance that if our proposition receives favorable consideration, and if the Heater is installed under anything like normal conditions that the buyer will be perfectly satisfied with the transaction, and glad that he chose the "COCHRANE."

Every little detail that enters into the design and construction of a Heater that shall be first class in every particular, thoroughly reliable, durable and easy to operate, has received most careful attention.

We are making and selling Heaters that are Heaters in every sense of the term. Would like to make one for you

Ask for Catalogue "2-H."

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Manufacturers,

N. Seventeenth St., Philadelphia, Pa.

THE "OHIO" STEAM PUMP

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All Valves and Internal Working Parts are Quickly Accessible. Most Convenient for the Engineer

THE OHIO STEAM PUMP COMPANY, WALNUT STREET CANTON, OHIO

HUNT "INDUSTRIAL" (Trade mark) RAILWAYS.

A narrow gauge system of track and cars for handling and transporting heavy and bulky materials of all kinds in manufacturing establishments, power stations, etc.

Standard Charging Car for Boiler Rooms.

Cars built to suit every variety of service, and so designed that they run around a curve of 12 feet radius as easily as a wagon turns a corner.

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THE WORLD MOVES.

So Do We—Across the Street.

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FRICK & LINDSAY CO.,

200 Wood St., Pittsburg, Pa.

The Bessemer Output—The American Iron & Steel Association has just collected the complete statistics of the production of Bessmeer steel ingots and Bessemer steel rails in the United States in 1901. The ingot statistics include the production of a few thousand tons of Bessemer steel castings. The total production of ingots in 1901 amounted to 8,713.302 gross tons, an increase of 2,028,532 tons or over 30 per cent over 1900. The production of 1901 was by far the largest in the history of the country.

The production of all kinds of Bessemer steel rails by the producers of Bessemer steel ingots in 1901 was 2,836,273 gross tons against 2,361,921 tons in 1900, 2,240,767 tons in 1899, and 1,955,427 tons in 1898. The maximum production of Bessemer steel rails by the producers of Bessemer steel ingots was reached in 1901. The year of next largest production was 1900 which is closely followed by its predecessor, 1899. In 1887, 14 years ago, 2,044,819 tons were made. In 1901 Pennsylvania made 1,406,008 tons of Bessemer steel rails, while 1,430,265 tons were made in other states. There is a considerable decline in 1901 in the production of steel rails weighing 85 pounds and over as compared with 1900. Great Britain's largest annual production of Bessemer steel rails was in 1882 when made 1,235,578 tons. In 1901 this country more than doubled her best year's work.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including March 17, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	[illegible]
Transit	382,575	255,[illegible]
Tidewater	114,107	56,[illegible]
Southwest	25,194	145,[illegible]
Eureka	11,885	515,[illegible]
Buckeye, Macksburg oil	1,072	196,[illegible]
New York Transit	190,500	
Southern	399,955	——
Crescent	99,942	——
Total	1,245,367	1,175,[illegible]
Daily averages	77,823	73,[illegible]

LIMA.

Buckeye / Indiana Local Division	921,482	772,[illegible]
Daily average	57,598	46,[illegible]

PRICES—CRUDE.

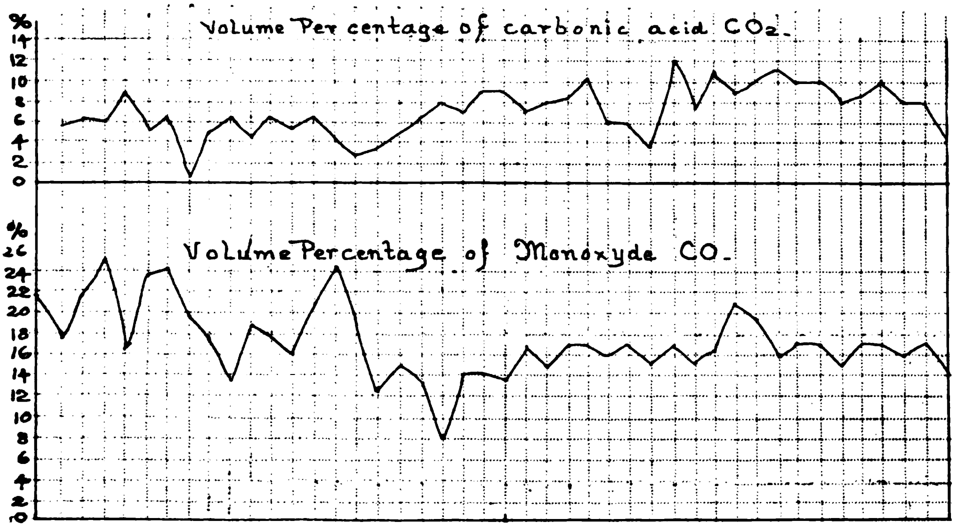
	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
March 12	$1.30	$1.15	$1.15	$0.83	$0.80	[illegible]
March 13	1.30	1.15	1.15	0.83	0.80	[illegible]
March 14	1.30	1.15	1.15	0.83	0.80	[illegible]
March 15	1.30	1.15	1.15	0.83	0.80	[illegible]
March 17	1.30	1.15	1.15	0.83	0.80	[illegible]
March 18	1.30	1.15	1.15	0.83	0.80	[illegible]

The J. M. Carmichaels coal works at Wellsburg, are to be improved and the mines extended to new holdings. A new tipple is to be put up.

J. E. Barnes, of Uniontown, Pa., has bought for $147,000, another large tract of coal land on Ten mile creek, in Harrison county.

BLAST ON GAS PRODUCERS.

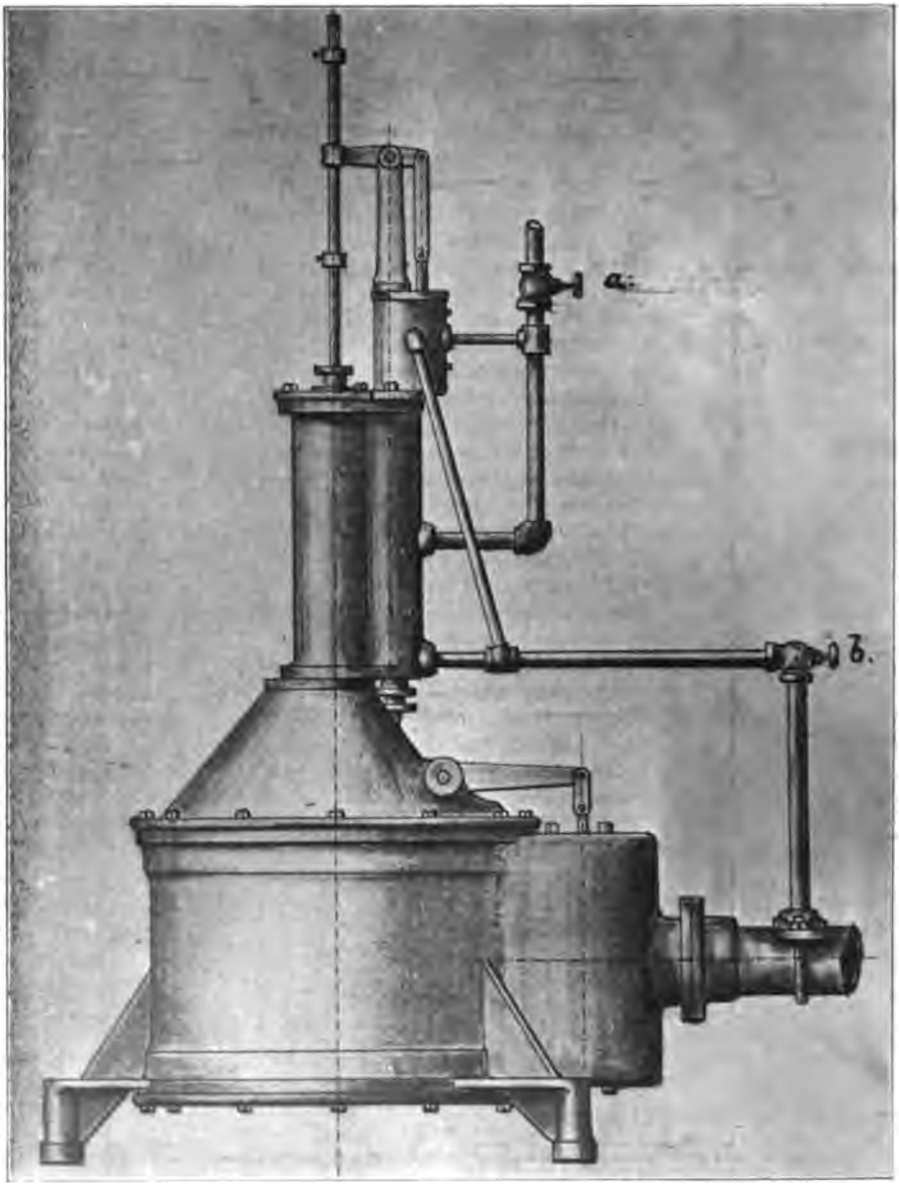
IN many manufacturing plants using generator gas the arrangement of the plant, or the peculiarity of the process employed, necessitates the supply of furnaces or fires by single producers, or by a small group of producers. It is frequently the case that the manager or superintendent of such plants complains of irregularity in the working of the furnace or of the producers. In case of trouble of this kind it is often rather difficult to locate the source of the trouble, the men working at the furnace generally seeking relief by blaming the gas man, who in turn charges the furnace crew or heater with lack of understanding or attention, or both agree in condemning the furnace, or producer, or both. This is especially frequently the case where only one or two producers are used to supplv the furnace with gas. A couple of cases of this kind came to the observation of the writer, where recriminations between the furnace men and the gas men made life unpleasant to both, and in order to find out the cause of the trouble tests of the gas were taken regularly, and the results of the analyses tabulated. A glance at the irregularity of the curve representing the constituents of the gas, (Fig 1.) to a great extent exonerated the furnace



Curves Showing Gas Constituents.

man, while the gas man justly claimed that he did the best that could be done. In one case the plant under observation consisted of a continuous heating furnace of usual and well demonstrated design and proportions, the gas for which was furnished by two gas producers of a type so much used and giving such general satisfaction in other places that the blame could not be well attributed to either furnace or producer. The steam for the blast injector was carried considerable distance in an unprotected pipe.. Close to the furnace was the steam valve which regulated the amount of steam for the blast, from where the pipe extended about 100 feet further to the producers which were placed, owing to local conditions, behind an intervening building practically cutting off communication between furnace man and gas man. The air injectors were of the usual type, and under certain conditions worked well. One peculiar observation was that the gas flue had a great tendency to get filled with soot,so as to necessitate the burning out of the flue once a day, and the burning out of the gas ports often twice a day. An inspection of the plant did not reveal any defect either in the producer or the furnace. The demand for gas happened to be sometimes irregular and it was observed that at times the injector, instead of drawing air, discharged considerable quantities of steam through the suction opening of the injector. Upon closer examination it was found that the injector worked best, that is, took the greatest amount of air, when the steam valve was about

one-eighth open. On allowing a greater quantity of steam, the quantity of air was, however, not increased in proportion, but considerably diminished and with the steam valve fully open the suction of air was stopped almost entirely, even a part of the steam issuing from the suction hole. This observation, of course, threw considerable light on the matter, and in the case in question, as a makeshift, a small valve was inserted, never allowing more steam to pass through than was necessary



Air Pump to Regulate Blast on Gas Producers.

for getting the largest quantity of air, as nearly as could be judged by rough experiments. This somewhat improved the working of the producer, at the same time, however, it made it impossible to force the producer in case an extra great amount of gas was required temporarily. A similar case was observed on another set of producers.

Whenever, for one reason or other, the furnace man turned off the steam it condensed in the pipe, and instead of a jet of steam, a jet of water was thrown into the injector, after the valve was opened. Whenever the heater required more gas, he turned on the steam valve far enough to blow into the injector quite enough steam but he got very little air with it. For a little while, provided the producer was in good order, things went very well, a large amount of water gas being formed which, owing to its better heating qualities, compared with carbonic gas, produced a rapid and intense heat. After a short while, however, the layer of incandescent coal had lost its heat, the gas supply fell off, the heater possibly opened the valve still more, to get more gas, with the effect that he got less and less. In this instance it was also recognized that the producer worked best with a moderate blast, and a pressure regulating valve was inserted, also with the necessary consequence that the producer never worked up to its full capacity.

It is well known that the proper proportions of air and steam in a producer blast vary with the quality of coal and with local peculiarities. Coal with a tendency to form clinkers requires, for the easy handling of the producer, more steam than coal fusing easily: on the other hand, producers, the gas of which has to be conducted considerable distances or to pass through narrow flues and gas ports, should receive in their blast comparatively little steam, to prevent the formation of soot, as the hydrocarbons always formed by a blast rich in steam, are not "fixed" but liable to deposit a part of their carbon in the flues or ports. It is, therefore, desirable to be able to regulate the proportions of air and steam to suit the requirements, and these proportions should be under strict and easy control, and not vary irresponsibly just in the reverse proportion of what they should be. It is hard to say, of course, how many producers suffer from this irregularity, but some certainly do, and many may be justly suspected. There are also numerous cases where the producers, owing to the limited amount of steam they receive, work regularly; these producers, nevertheless, can be improved by allowing them a geater amount of steam, if only care is taken to give them to a greater and proportionate amount of air (which many injectors do not). Such producers then could turn out a far greater quantity of gas of the same quality. Where a large number of producers discharge into a common flue, these irregularities, of course, are to a great extent, if not entirely, neutralized by the mixing of the gases from the different sources, but even then the question remains if it were not better if each individual producer worked regularly to its full (or desired) capacity. But in small installations with only one or two producers, these troubles are sometimes aggravating and much, frequently unjust, comment is passed upon furnace, producer, and the men handling the same. An effective remedy for this trouble can be found in the application of a cylinder or volume blower which automatically measures to each cylinder full of air a proper amount of steam. Fig. 2 shows the arrangement of such an air pump.

An air cylinder of light construction corresponding to the trifling pressure carries a very small steam cylinder, the valve of which is operated by a pilot cylinder, the valve of which in turn, is moved by two set collars in the main piston rod. There is nothing particularly new in this arrangement, which is frequently applied to the best makes of direct acting pumps, except its application for measuring air and steam. The steam cylinder is proportioned for the largest amount of steam desirable in a cylinder full of air, and, if less steam is required, its amount is reduced by simply turning off partly the supply of live steam by the valve a. The speed of the pump, and thereby the quantity of blast, is regulated by throttling the exhaust steam by the valve b. Regardless of the pressure of the live steam on the steam piston, it can not move the piston faster than the exhaust steam in front of the piston can escape through the valve b into the air supply pipe. By partly turning off the live steam at the valve a, the same volume of steam enters the cylinder, but the resistance before the piston being too small, it will operate the pump with lower pressure, and lesser density, so that the relative quantity of air and steam can be measured very effectively. The exhaust valve then should be placed under control of the furnaceman, as it regulates the quantity of blast, and thereby the quantity of the gas without changing its composition, while the steam valve should be left in charge of the producer man, as any alteration of it will alter the relative proportions of the air and steam in the blast, without affecting essentially the quantity of the gas.

COMPARATIVE OPERATING COSTS.

BY J. D. LYON.

GAS engines have made such serious attacks upon the position of the steam engine, as the motor par exellence, that power users are confronted with a question not raised a few years ago; that of judging between two classes of engines. Until comparatively recent times the steam engine has had no rival except in a few favored localities near power producing streams. A little later small gas engines began to supplant the steam engine for operating small pumps, printing presses, and a great variety of other small uses, but it was not until within the last ten years that the gas engine assumed a position of real rivalry with the steam engine. At the present time gas engines can be had in large sizes of 1,000 horse-power, or more, but these are advanced types, the use of which is yet beyond the average purchaser's requirements. An engine of about 100 horse-power is frequently specified and for a comparison between gas and steam engines this size will be assumed. A gas engine of this size will cost, erected complete, say $4,000 and it will require one man to operate it. As this man need not be an expert engineer, $2.00 per day is a fair allowance for wages. As to fuel we have a wide range of prices in the natural gas belt from as low as 7 cents per thousand cubic feet, which some purchasers estimate the gas to be worth at the well, to 25 cents per thousand cubic feet net, charged small and moderate consumers by the Philadelphia Company in Pittsburg and Allegheny. For the purpose of comparison a price of 20 cents per thousand cubic feet will be assumed. Most builders of gas engines will guarantee a gas consumption not exceeding 14 cubic feet per brake horse-power hour, with gas having a calorific value of about 950 British thermal units per cubic foot. A good gas engine operated under fair conditions of loading should do considerably better than this guarantee.

To produce 100 brake horse-power for a working day of ten hours will require 14,000 cubic feet of gas costing $2.80 per day. Summarizing the operating expenses of the gas engine, we have:

Interest on $4,000 at 6 per cent	$240
Depreciation and repairs, 1 per cent	400
Gas, 300 days,	840
Attendant	600
Oil waste, etc., say	75
Total per year	$2,155

An automatic steam engine of 100 horse-power will cost, erected with boiler and other equipment, about $2,500. Such a steam plant, which represents about the average in quality and efficiency of installations in this vicinity, will burn in actual service probably not less than five pounds of coal per horse-power hour. The cheap coal fired under boilers costs about $1.50 per ton, and attendance will cost, with one man serving as engineer and fireman, at least $3.00 per day.

Summarizing the operating expenses of the steam engine, we have:

Interest on $2,500 at 6 per cent	$150
Depreciation and repairs, 10 per cent	300
Coal, 300 days	1,125
Attendant	900
Oil, waste, etc.,	75
Total per year	$2,550

or a saving in favor of the gas engine of $395 per year.

From these figures partisans of the steam engine may draw conclusions favorable to their engine on the ground that $395 is not a high rate to pay for the greater reliability of the steam engine. This difference in favor of the steam engine seems to be accepted among a large number of power users, and the writer is sorry to say that in his opinion gas engine builders themselves are responsible for this assump-

tion. At one time customers were given to understand that "anybody" could operate and care for a gas engine properly, and in some cases they were even told that if the engine were started and oiled occasionally it would practically take care of itself. Many trials of this method produced the inevitable result—trouble and general unreliability. The unsavory reputation of the small engine passed on to succeeding larger sizes; and even now when many thousands of gas engines of sizes, which would have been considered very large a few years ago are in successful use, the mind of the purchaser reverts to mornings he has seen wasted in getting small engines started. However, it is gratifying to believers in the gas engine to know that a more sensible view is now taken in regard to the gas engine, and it is at present as well cared for generally by engine users as the steam engine. Owing to the inherent quality of cleanliness the engine responds to systematic care, and many well-kept, and consequently successful gas engine plants are now in daily operation with attendants devoting over half their time to other duties.

The writer is familiar with a number of gas engine plants which are run every day, Sunday included, with not over one hour in 24 shut down. He has also known of several gas engines in fair sizes that have been run for from two weeks to four months without stopping. It may be held that five pounds of coal per horse-power hour, is too high an estimate for the steam plant, and that by making the steam engine investment equal to that of the gas engine and putting in a higher grade boiler and engine, the fuel cost of the steam plant could be made lower than that of the gas engine. This may be granted in the very few cases in which the load is approximately constant at the point of highest efficiency for the steam engine; for while the efficiency of the gas engine is far greater than the steam engine its economy may be less, owing to the difference in cost of real calorific values in gas and coal; but in all cases in which the load is subject to more or less sudden variations, and in which the average load is considerably below the maximum, the gas engine economy is greater in that esteem by reason of the ability of the gas engine to regulate its fuel consumption to the work done. The figures shown, the writer believes, rather favor the steam engine, since 20 cents per thousand cubic feet for natural gas probably is above the average price paid and $1.50 per ton is rather cheap for coal under average conditions in plants of the size assumed.

There are hundreds of plants in operation in the natural gas belt in which steam engines are used, where gas could be obtained at 10 cents to 15 cents per thousand, and some even in which gas costs absolutely nothing. In cases of this kind ignorance and prejudice are increasing operating expenses, and the sooner the owner realizes that the gas engine is no longer a troublesome toy, of almost human obstinacy, but a practical, reliable servant, the better it will be for his pocketbook.

Briquetting in New Mexico—The Colorado Fuel & Mining Company sibuilding a briquetting plant at Gallup, N. M., and the machinery is being placed. The plant has been experimented with for some time but the managers do not thoroughly understand how to secure the best results, and as a consequence they are sparing neither time nor money to make the plant perfect. They term this an experimental plant, and if they succeed in placing it on a paying basis, expect to build in that vicinity a plant to cost $50,000. When the present structure is complete and the machinery adjusted they will have expended over $40,000, and to keep this sized plant in operation it will require about 100 men working an 8 hour day in the mine and 25 men in the building.

The object of the company is to utilize the slack coal that is screened at the mine, and should the amount of slack be sufficient for the constant operating of the plant, large coal can be used to profitable advantage. It has been claimed the by-products —carbon, gas, ammonia and small amount of benzine will more than pay the cost of the operation of the plant, and the briquettes, which are 3 inch cubes, will be in great demand when once on the market. The engineers of the Santa Fe Pacific are running surveys for a new spur from the main line to the works. About 400 tons of slack will be reduced to briquettes each day during the experimental campaign.

NOTES FOR THE CHEMIST.

Determination of Iodine Number—Joseph Hanus (Ziet. Nahr-Genussm., 4-913). The examination of lubricating oils being now a part of the routine laboratory work, the following short method of determining the I. number by using an acetic iodine monobromide solution, should be of general interest. Iodine monobromide may be easily prepared by slowly adding 13 gms of Br. to 20 gms. powdered I. with constant stirring and cooling to 5-8 degrees C. The reaction takes about 10 minutes for completion and the product is freed from any uncombined Br. by passing a rapid current of CO_2 over it. It is a grey, crystalline, metallic-looking substance and should be preserved in a stoppered bottle.

The author prefers to use its solution in acetic acid instead of Hubl's solution for the following reasons: Its strength is readily ascertained by adding K.I. and titrating with sodium thiosulphate; it keeps for a considerable time and it acts on fats with greater rapidity, so that an absorption takes only 10 to 15 minutes. Ten grams of the compound should be dissolved in 500 c. c. glacial acetic acid. 0.6-0.7 gms. solid fats, 0.2-0.25 gms of oils having an I. number below 120, or 0.1-0.15 gms. of oils showing a higher figure, is dissolved in a beaker or flask in 10 c. c. chloroform, and 25 c. c. standardized monobromide solution are then aded. After standing 10 minutes (fats) or 15 minutes (oils) 15 c. c. of K. I. solution (1:10) are added, and the liberated iodine titrated with N-10 sodium thiosulphate without using starch. Results agree with those of Hubl and from four to twenty-four hours time is saved.

Run a blank and from that subtract the number of c. c. used in titrating sample. This gives the thiosulphate equal to the I. absorbed by the oil. Multiply by the I. value of thiosulphate to find weight of I. Divide by weight of sample and multiply by 100 to get Iodine number.

"The thiosulphate solution may be standardized by potas. dichromate. (3.8747 gms. per liter. 20c. c.=0.2 gm iodine—Gill).

Hubl gives following formula for the calculation of the percentage of adulteration of one oil by another: Let x=percentage of one oil and y=percentage of the other oil, m=iodine value of pure oil x, n of pure oil y, and I. of the sample under examination; then,

$$x = \frac{100(I-n)}{m-n}.$$

Maumene's Test for Oils—By H. C. Sherman, J. L. Danziger and L. Kohnstamm. (Jour. Am. Chem. Soc. Mar. 1902) As originally described and generally carried out, the test consists in adding to 50 grams of the oil in a beaker, 10c. c. of strong sulphuric acid (66 degrees Be.), stirring with a thermometer and observing the rise in temperature. To reduce the radiation of heat, the beaker should be packed with asbestos in a larger beaker. The authors add the acid with a pipette delivering the 10 c. c. in 10 seconds and stir until maximum temperature is reached. Results are stated as "specific temperature reaction," that is, the rise of temperature is multiplied by 100 and divided by rise observed when 50 grams of water are treated with 10 c. c. of same acid under same conditions. To overcome the violent reaction of the acid with some animal and vegetable oils, the practice has been to dilute them with some comparatively inactive oil, mineral oils of low specific gravity being commonly employed. With equal volumes of the oils, the rise observed with the mixture is taken to be the mean between the rise observed in the mineral oil alone and that which would be given by 50 grams of the sample. The authors find this method to give high results and suggest the use of a weaker acid (89 to 90 per cent) and the direct treatment of all oils. The results obtained on drying oil (which give a too violent reaction with strong acid) will then become comparable with those of non-drying oils. The article contains four tables giving specific temperature reactions of commecial oils.

Determination of Manganese in Iron—by W. A. Noyes and G. H. Clay (Jour. Am. Chem. Soc. Mar. 1902). Reagents—Ferrous Ammonium Sulphate. Dissolve 8.56 grams in water containing 40 c. c. sulphuric acid (25 per cent), and dilute to 1 liter. Potas. Permanganate—1 c. c. should equal about 0.001 gram iron. Multiply iron equivalent by 55-112 for Mn. value. Sodium Acetate—30 grams of the crystallized salt, 30 c. c.

acetic acid (30 per cent), and 170 c. c. water. Bromine water—a saturated solution.

Method—Dissolve 1.5 grams sample in 25 c. c. nitric acid (sp. gr.1.20), or in 20c. c. nitric and 5 c. c. hydrochloric (1.12).Heat until dissolved, transfer to a 300 c. c. flask, add a solution of sodium carbonate until nearly neutral, and then an emulsion of zinc oxide slowly till the precipitate of ferric hydroxide forms. After two minutes, add excess of zinc oxide. Dilute to 300 c. c., mix in a dry beaker and filter off 200 c. c. through a dry filter. Add 20 c. c. acetate solution and 40 c. c. Br. water. Heat nearly to boiling, stirring and adding more Br. if necessary, until the precipitate of manganese dioxide separates. Filter and wash with water. Place beaker under funnel and drop solution of ferrous ammonium sulphate on the precipitate until dissolved. Unless the Mn. exceeds 0.4 per cent, not more than 20 c. c. of the solution should be used. Wash out filter, examine beaker to see that any precipitate remaining in it has been re-dissolved. Titrate with permanganate solution. Titrate a blank on ferrous ammonium sulphate solution.

Subtract number of c. c. used for sample from results of blank and multiply b manganese equivalent of pemanganate solution to get amount of manganese in 1 gram sample.

To test this method the authors prepared an iron solution free from Mn. by dissolving ammonia ferric alum, precipitating with NaOH, washing by decantation and re-dissolving in H_2SO_4. A manganese solution was prepared by dissolving a weighed quantity of potas. permanganate in water, just decolorizing with sulphurous acid and diluting to known volume. A quantity of iron solution containing 1.5 grams iron was mixed with a measured quantity of manganese solution and the Mn. determined as described above. The authors find that evaporation with sulphuric acid to expel nitric acid as is done in Volhard's method, is unnecessary, and that the presence of hydrochloric acid does not inerfere with the precipitation of Mn. in above method.

Siberian Iron Mines—The industrial development of Siberia is largely dependent upon her production of coal and iron, especially the latter, and the following data from an official report show that Russia's huge Northern provinces do not lack rich deposits of this metal.

Of the numerous iron ore mines in the Urals, the largest are, first, the Komaroff mine, containing 1,600,000, tons of 50 per cent brown hematite; and second, the Magnithaya Gora mine, which has not yet been fully developed, but is claimed to be the largest mass of magnetite in Russia, if not in the world. Among other rich mines in the Southern Urals are the Baikal mines, which are believed to contain 5,000,000 tons of ore in the portions belonging to the government, and 16,000,000 tons in that owned by the Simsky works; and the Elnitchi mines, near Baikal, in which about 1,000,000 tons of ore have been discovered. It is claimed that the latter group of mines, lying to the South of the Fcheliabinsk-Ufa branch of the Siberian Railway, will yield 2,400.000,000 tons of iron ore. The Vyoskaya Gora, Mount Blagodat, and Sindrsky mines are to the North of the same railway. Engineers report that the first contains 16,000,000 tons; the ore in the second was estimated at 6,400,000 tons when first examined, but upon re-examination was found to amount to 13,000,000 tons. No definite estimate was made concerning the last mine, as it abounds in pockets which sometimes come to an abrupt termination. It is claimed that the Ural mines are capable of producing 24,000,000 tons of ore, or about 10,000,000 tons of pig iron per annum for the next century; but as this quantity of ore can scarcely be worked, even with the additional coal from the Ekibaz-Tuza and Sudjenka mines, the more conservative engineers reckon the output at 5,000,000 tons a year, at which rate the ore in sight wil last two hundred years.

BRYAN DONKIN DEAD.

BRYAN DONKIN, the British authority on engineering whose word was accepted the world over, died Monday March 3, at the Grand Hotel, Brussels, Belgium. His death was sudden and entirely unexpected, but he had recently consulted his cousin, distinguished in the medical profession—Dr. Horatio Bryan Donkin—who, while he felt that it was not a case for complete cessation from work, counseled some diminution of the ardor with which Mr. Donkin had been wont to prosecute his absorbing studies in thermodynamics and other branches of engineering science. While obeying this suggestion he had occasion to go to Brussels late in February, in connection with an engine trial, and after being engaged on experimental work during the day, he was taken ill at night, after retiring to his room, and died, almost instantly, before medical aid which had been summoned could reach him. He has thus passed suddenly away while in the zenith of his career, and to all appearance with many years of good work before him.

The late Bryan Donkiu.

Mr. Donkin was in his sixty-seventh year, having been born in 1835, the eldest son of a well-known engineer—John Donkin—and the grandson of a still more brilliant scientist—Bryan Donkin, who in 1803 founded the well-known works at Bermondsey, and was the perfecter of the paper-making machinery with which his name will always be associated. And thus it resulted that, after his education at the University College of London and at the Ecole Centrale des Arts et Metiers in Paris for two years, and after apprenticeship under his uncle, in the Bermondsey works, Bryan Donkin, Jun., as he was long known, was sent to St. Petersburg in 1859, to superintend the completion and erection of the largest paper-mill in Europe for the making of Imperial bank notes and state papers. He continued in Russia for two years, and laid the foundation of an acquaintance with European engineers and machinery practice which served to influence his after career, for there is no doubt that his friendship with Professors Dwelshauvers-Dery, Hirn, and others directed his energies into those paths of experimental research along which he subsequently worked to the best advantage of the profession.

In 1900 he relinquished active participation in the management of the works. In the early seventies circumstances had so affected the paper making industry that it had ceased to engage the works so fully as formerly; and thus the subject of this memoir had his attention directed to the scientific side of engine design. About this time the firm introduced the Farey engine—Mr. Farey being a partner. In this design the cylinders were placed in line, back to back: the high-pressure cylinder was situated near to the crankshaft, while the low-pressure cylinder worked with its piston away from the crank. Both piston rods had separate crossheads, which were connected by rods passing along each side the cylinder, and so arranged that the pistons were supported through the crosshead slides, which had ample bearing surfaces; an arrangement that prevented the pistons from dragging on the bottom of the cylinders and minimized wear. An engine so made for a paper mill in Devonshire was very effectively tested with the view of arriving at its efficiency. Such trials are quite

common to-day; but were then very exceptional, mill owners accepting a rough approximation of economy, arrived at by a comparison with the conditions which formerly prevailed, irrespective of any standard upon which to base such deduction. The results of the trial, showing a consumption of 20.55 pounds of water per horse power hour and a coal consumption of 1.9 pounds were published in Engineering, London, of November 3, 1871.

This was the first of a long series of tests of engines and boilers undertaken right up to the end, for the last was made with a boiler at Fraser's Bow Works last month; the report was prepared, but never signed. It is difficult to fully appraise the wide influence of such successive trials, of the lessons they inculcated, and of Mr. Donkin's incessant advocacy of such scientific measurements as to the true possibilites of all prime movers. As long ago as February 5, 1875, engineers commended Mr. Donkin's work, pointing out the simplicity of such steam consumption tests, measured as they were then by the weight of water flowing over a tumbling bay. Perhaps his first most effective examination was in connection with steam pumps for the Barnet water works, where he made a complete balance-sheet to show the effective work done, as measured by the water pumped, and its proportion to the heat value of the fuel used.

From this general work to investigations toward improvements in detail was but a natural step; and one department in which Mr. Donkin did specially valuable service had reference to steam condensation in cylinders, its reduction by jacketing and superheating, and to the investigation of the laws covering the transmission of heat through cylinder walls. From the early seventies this subject had fascination for him, and in dealing with it he became directly associated with Professor Dwelshauvers-Dery; but it was not until about 1888 that he perfected his "revealer"—a simple apparatus, frequently described, wherewith he was able to make diagrams illustrative of the extent of condensation under varying conditions. By this apparatus we were placed in possession of definite knowledge of the state of the internal walls of cylinders; and the long series of trials made by himself, and in collaboration with others, including Professor Kennedy, Professor Hudson Baere, Lieut.-Colonel English, etc., has borne direct practical fruit. It is scarcely necessary to review at length his recent work in this direction,. It established the advantage of the covers as well as the barrels being jacketed, and the value of superheated steam in reducing such initial condensation; but, on the other hand, he continued doubtful as to whether the very high degree of superheat in some modern apparatus brought a gain corresponding to the cost expended in the process and the practical troubles involved.

Early in the nineties Mr. Donkin directed his attention to the subject of internal-combustion motors, and found in them also a subject congenial to his inquiring disposition and facile pen. In 1894 he read a paper before the Incorporated Institute of Gas Engineers, reviewing the comparative merits of steam and gas motors; and in the same year prepared for the Manchester Association of Engineers a review of the scientific work of Hirn, which is as lucid as it is instructive and sympathetic. A year later Messrs. Griffin published the first edition of his standard work on "The Gas Engine," now in its third edition, and later he translated Diesel's work on "The Theory and Construction of the Rational Heat Motor." At the same time he was himself engaged in original research work in connection with internal-combustion engines, and he acted as a judge for the Royal Agricultural Society and at other competitions.

The steam boiler was always to him a source of inspiration, and along with Professor Kennedy he made most exhaustive tests of twenty-one different types of boilers, which were published some eight years ago and which were subsequently issued in book form. While establishing desiderata, they diagnose ills, and from this point of view stand as records for guidance in design, construction, and working. He also published, through Messrs. Griffin, in 1898, a book on the steam boiler, with details as to the heat value of fuel, analyses of gases, evaporation, etc. He introduced at his works the Perret system of forced draught, the manufacture of which apparatus was taken up by his firm and successfully developed.

In this system deep and thin bars—about 1-10 inch thick—are used, and are immersed in a trough of water, over which the forced draught is carried on its way between the bars, the aim being to keep the grate cool, so that dust and fine coal can be burned without any clinker adhering. On this subject he read a paper in 1892 before the North of England Institute of Mining and Mechanical Engineers. In conjunction with Mr. J. Holliday, he also did some experimental testing with fuel calorimeters. Centrifugal fans formed the subject of other investigations; while about twelve years ago he worked upon the velocity of air through pipes with anemometers at the Vauxhall water works. The results in all three cases were given in papers to the Institution of Civil Engineers. In later years, too, motor-cars absorbed much of his attention as a member of the Automobile Club and as a manufacturer of the motor.

There are few volumes of the proceedings of the leading technical institutions without some contribution from him, for he was as willing as he was able from his extensive practice to add to the profit derivable from any discussion. Well informed, precise in his methods, clear in his deductions, and with an excellent style, his papers were always appreciated; while his intervention in debate, even if it were only to ask for elucidation of some indefinite point, was ever welcome. He was a vice-president of the Institution of Mechanical Engineers, a Watt medalist and Telford and Manby premium and prizeman of the Institution of Civil Engineers, a member of the Royal Institution, of the Societe Industrielle de Mulhouse, of the Verein Deutscher Ingenieure, and of the American Society of Mechanical Engineers; and alike for his great ability and his geniality, his loss will be sadly regretted.

South American Copper.

DURING the last five years the production of copper in the various countries of South America has been greatly stimulated by the high prices inaugurated at the beginning of 1899. Chili is the principal contributor, and in the twelve months ending January 31 the shipments from that country reached 30,200 tons, as compared with 27,000 tons in 1900-1, 24.550 tons in 1899-1900, and 22,700 tons in 1896-7. So far as this particular republic is concerned, the improvement is due entirely to the rise in values and the resultant increase in profits. Prior to the advent of the American syndicate in the copper market, Chili was under a cloud. Enterprise was languishing: fresh capital was not being attracted because of the quotations ruling: and the cost of production and of laying down in Europe left rather a narrow margin for mine-owners. But since that epoch-making event, the situation has changed completely. Prospectors we are assured on the highest mining authority, are feverishly searching for copper where a few years ago they would not have troubled to look for it, and old mines are being re-worked in places where it was thought they had been abandoned forever. This extraordinary activity is, of course, not confined to Chili: it is quite general, and soon or late it will be certain to tell upon the price of the metal.

On the other hand, rapid as is the world's production of copper, it does not promise to keep very much in front of the world's consumption, for another five or ten or years at least: and while there is no good reason why the price should again go to £70, there is plenty of reason why it should not go down to the low average of 1894 and those contiguous years, when business was poor and stocks were large. The present endeavor is to keep it in the neighborhood of £60 per ton: but in all probability £55 will be nearer the average. Much depends upon the issue of the present duel between the Amalgamated Copper Company and the Rio Tinto interests: but a cutting policy is not likely to be carried to the point of ruination, and before long prices should be fixed at a level which will give a good return to the producer, and at the same time free the consumer from the nuisance of sharp fluctuations in price, such as he has been treated to during the last three years.

Chili possesses a great area of undeveloped copper bearing land at El Cobre, Paposa, Cabija, and other places, and if fuel were readily available and cheap, and more

modern plants were installed, it would be good for a very large increase upon its present total. In some of the Andes ranges the veins have a nasty way of pinching out when they look most promising, and difficulty is sometimes experienced in picking the metal to a high percentage. But these are exceptional conditions. Generally, the veins improve at depth, as witness the Copiapo, where a shaft has been sunk to 2,700 feet. If other mines would bore deeply instead of being contented with 300 feet or 400 feet, the results would be much more encouraging even than they are now. Mr. S. R. Adcock, formerly chief chemist to the Rio Tinto Company. gave recently some particulars of the deposits on the property of the Copaquire Copper Sulphate Company, which he was sent out to examine. Mr. Adcock describes the ore as the most remarkable which has ever been brought under his notice, and he believes it will have a marked influence on the future shipments of copper from Chili. The mineral comes from a series of hills, which are situated at an altitude of some 11,530 feet, about 35 miles from Lagunas, the termination of the Nitrate Railway in the province of Tarapaca, and the extraordinary feature is that the copper is found almost entirely in an oxidized state, principally as sulphate. The average copper contents appears to be between two and three per cent, of which 70 to 80 per cent exists as a pure sulphate of copper, solable in water, the remainder, as carbonate, with, in some instances, a small percentage of sulphide. "The hills containing this deposit," adds Mr. Adcock, "are of enormous extent, and the character of the rock of which the hills are composed being the same throughout, there is no reason to doubt that the whole mass of hills is cupreous, as is stated to be the case by the eminent engineers whose report has been placed before me. The ore lends itself to the most simple treatment, while it is so exceedingly soft that it can be quarried with the greatest ease and expedition, and is so friable that even large pieces, weighing 2 cwt. or 5 cwt., each, when immersed in water, are rapidly disintegrated and become simply a muddy deposit, the copper sulphate simultaneously coming into solution." Considering the friability or "rotted" state of the rock and the fact of the copper occurring as a soluble salt, and other natural advantages of the property, such as ample water supply, good labor, etc., copper ought to be procured very cheaply. Mr. Adcock says: "Ore is mined more cheaply than in probably any mine known today where copper is the sole product;" and he states further that the value of the metal existing as a soluble salt, at present measured up, approximates some £10,000,000 sterling, that value being contained in only a small percentage of the actual tonnage visible. As the remaining mass presents identically the same indications as that examined and tested, and shows sulphate at surface wherever tested, there seems ground to assume that it is uniformly cupreous, and the working of this deposit should therefore before long largely affect the shipments of copper from Chili.

The future of Peru as a copper producer depends mainly upon the development of the Cerro de Pasco district. This district is 14 miles from Callao, and 80 beyond the terminus of the Central Railway at Oroya. It lies at an elevation of 14,300 feet above the sea, and, considering the difficulties of transport, the strides made since the commencement of shipments in 1897 have been striking. Plans have now been completed for an extension of the railway from Oroya right into the heart of the mineral field. The climate in those high reaches of the Andes is healthy, though somewhat cold, and a mining population of a fairly reliable character is ready to hand to the number of 10,000 or 12,000. Surveys of the district are by no means exhaustive, yet such incomplete investigations as there have been, proved beyond a doubt that the ground is immensely rich. The copper comes from old silver workings. Time was, a few years ago, when large banks, deposits and layers of copper in a silver mine were regarded as a nuisance and a misfortune by the miners. It involved a loss of time and an expenditure of energy and money, to work through them and to remove the obstacles to the refuse heap. Things have changed since then, and apart from the deposits still in the workings, there are between 5,000,000 and 6,000,000 tons of copper ore already in sight. The cost of production is said to be from 6s to 8s per ton. Copper is now the leading mineral, and when the cost of transport to the coast is reduced to a fair level, there should be a considerable development, in

view of the steady growth of the world's consumption, and the present inclination of production to lag behind. The output of ore to-day is stated to be some 3,000 tons per month, and of this at least two-thirds remain piled up at Cerro de Pasco for lack of transport to take it on to Oroya for shipment. The cost of animal carriage amounts to as much as £8 per ton. From Oroya the ores go by rail to Callao, the charge being £1 10 s per ton, and thence they are shipped almost invariably to Liverpool or Swansea, the freight and general charges amounting to some £3. The copper ores now being mined range from 35 to 40 per cent of pure copper, and, al though the total charges amount to about £14 per ton, there is a highly satisfactory margin.

The lower workings, where rich ores are anticipated, are under water; and for many years the question of draining them has been under consideration, but for various reasons the work has not yet been undertaken seriously A syndicate formed in Lima has obtained a concession from the Peruvian government, and apparently it means business. The object is to continue the perforation of the Rumiallana tunnel, the construction of which was discontinued more than twenty years ago. The writer of the consular report on Peru for 1900 says: "The mass of ore is confined within a compact area, which renders it possible to drain the mines with one tunnel only. The mineral district extends over a depression surrounded by low hills. There are various ponds within the depression. Their proximity, and the filtrations through the neighboring hills, explain the cause of the flooding of the mines. The extent of the depression is about 2,225 yards from North to South and 1,500 yards from East to West; while the mass of ore extends over 2,000 yards from North to South and about 1,100 yards from East to West. Notwithstanding the fact that the district has been worked for about 260 years, Raimondi, the well-known Italian geographer and geologist, asserted in 1885 that this almost solid mass of ore had barely been scratched, and this statement has been corroborated by various competent mining engineers."

An encouraging feature of the situation is the presence of coal in abundance at distances varying from 6 to 20 miles from Cerro de Pasco, the most important mines being at Chacayan and Yanahuanca, 18 miles to the N. N. W. The cost of conveyance of fuel for short distances is excessive, being from £11 16s to £3 per ton. It is consumed in the reverberatory furnaces, in reducing the copper ore to matte. The question of constructing a coal railway has already been taken into consideration, but no capital is forthcoming so far. It will, no doubt. come later. Chili is also awaking to the fact that it possesses fuel. That which has been found is not of very good quality, and consists mostly of lignites of the tertiary formation which are worked in Lota, Buen Retiro, Coronel, Puchoco, Curalinahue, Lebu, Huenapiden, Santa Ana, and Cerro Verde. There are other places on the coast where seams are met with—as, for instance, at San Antonio. Cobquecura, Dichato, and near Talcahuano. Indications, or outcrops, of coal have been met with in the Nahuebata range, and near Muchen and Vieja Imperial; and it has been asserted that coal would be found towards the West of the Central Cordillera. There is a coalfield also at Catamatun, near the river Tuta, in the province of Valdivia. It is thought that further and more scientific investigations would reveal more important seams than these, and in closer contiguity to the copper mines has long been recommended that coal, like all other minerals should be declared to be the property of the state, and that, like all other minerals, it should be "denunciable." The adoption of these two measures, together with the granting of moderate-sized concessions would lead to the creation of a number of small collieries in different parts of the country, and would lead to a healthy competition in price. The only check at the present time is the imported article.

Big Hammer No More—The 125 ton stroke armor plate hammer at the Bethlehem steel works, the largest of its kind in the United States, and, which has not been in use for many years owing to its turning everything else in the works topsy turvy, is being converted into scrap. A fac simile of the hammer was exhibited in the Manufacturers' Building at the World's Fair in Chicago, in 1893, and caused the amazement of thousands interested in mechanics. The hammer, which stood a good four stories in height, was razed and its destruction begun by breaking under a drop weight.

BLAST FURNACE GAS ENGINE UNDER LATE DEVELOPMENT.

A BLAST furnace gas engine in the plant of the Sheepbridge Coal & Iron Company, near Chesterfield, England, embodies the results of the Blast Furnace Power Company's latest improvements. The power installation supplies the energy to drive the electric generators that provide the electric current for incandescent and arc lighting and the power for driving traveling cranes, blowers, turn-tables, sand mills, and machinery of the pipe foundry. Tests arranged by Herbert Pilkington, and supervised by members of the staff were recently made during ordinary every-day running periods so as to represent every-day results. The tests gave results that may be considered satisfactory in every respect. The special features to the gas engine are covered by the Blast Furnace Power Company's patents. Among the special features of this engine is the method of cooling the water jacket designed by B. H. Thwaite. The water cooling device is so successful that the running cost of water is almost inappreciable. Mr. Thwaite's system of automatically indicating when the bearings begin to show signs of overheating is also applied. One of the effects of the automatic hot bearing indicator is the reduction of the oil consumption. It is well known by engineers that once a bearing is allowed to be raised above a certain temperature the oil consumption is greatly increased. In the installation the consumption of oil is in no way abnormal, and it will compare favorably with steam engine practice.

The attendance and labor costs of this installation are low; so little special skill or responsibility is necessary that ordinary unskilled intelligent laborers were in charge during the terrible December storms. Although the steam installations suffered from the violent influences and fluctuations of temperature, the blast furnace power gas plant, which is required to run continuously from Monday morning till Saturday night, was not in the least degree affected; it ran through the succession of storms without a hitch.

The gas treatment plant is the Thwaite standard size, and it works without a hitch; although the thermal value of the gas is low. the thermo-dynamic results are almost as high as can be practically obtained by internal combustion engines.

The analysis of the gas collected during the running period of the test is as follows:—

Temperature at holder....40 degrees Fah. (4½ degrees C.)

		Volume per cent.
Combustible proportion 27 per cent	CO	=22.4
	H	= 3.8
	CH_4	= 0.8
Inert per cent 73 per cent	CO_2	= 7.8
	O	= 2.2
	N	=63.0

Calculated average=

Thermal value per cubic metre 909.8 calories.

Thermal value per cubic foot at 60 degrees Fah. 894 B. T. U's

Mechanical efficiency of the installation.

I.H. P.—E. H. P. per cent, including dynamo, belt, fan, circulating pump and counter shaft losses=71 per cent.

Volume of gas units per I. H. P. hour =116.8 cubic feet.

Thermal units per E.H.P. hour =14,608

Thermal units per I. H. P. hour =10,442

Thermal efficiency E. H. P.

Including all losses as stated =17.4 per cent

Thermal efficiency I.H.P. =24.3 per cent

The electric machinery is of the direct type driven by belt, and the complete installation is a decided credit to the enterprise of the Sheepbridge Coal & Iron Company.

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EDITORIAL COMMENT.

The Leopard's Spots—The observant man may be pardoned if he deliberates long and cautiously over the possible deliverances of the joint civic committee at the head of which is Senator Marcus A. Hanna. At first sight it appears almost impossible that the committee will be able to accomplish anything satisfactory. A second view taken with all deliberateness rather tends to strengthen the convictions of the first. It would be nothing short of phenomenal if interests so widely separated could be identified in a day and it is expecting too much to hope that the statements made in public concerning the anticipated outcome of the work of that committee, representing divergent interests, ever can be realized through the methods proposed.

The desire is universal, without question, that labor and capital cease the useless expenditure of energy as exemplified in strikes and kindred movements, but it seems morally certain that if ever that end is attained it will not be reached through the medium of such a committee as has been set to work principally by the action of Senator Hanna. One might go further and assert that if ever the natural antagonisms of detail between labor and capital are harmonized so completely as to be eliminated from industrial connections it will not, because it cannot, come by way of Senator Hanna. There is no doubt that much, indeed all that is desirable, could be accomplished by some man, an employer of labor on a large scale, who entered into the case in the spirit that would attract the interest of both sides. It is impossible to recall the time when Senator Hanna, as an employer of labor, exhibited any traits that would even faintly suggest him as the man to lead a movement to effectually harmonize those minor differences between labor and capital. In all his experiences with labor his course has not indicated in the slightest degree any desire to have the relations between the two forces otherwise than as he chose. For years the bituminous coal miners have pointed to the Ohio senator as a conspicuous example of an employer who refused to consider his subordinates as otherwise than as automatons.

In the light of his record Senator Hanna is not the man to receive the full confidence of the laborers and with that confidence taken out of the negotiations there is no reason to hope for results that will justify the time consumed in the effort. If Senator Hanna is seriously concerned in this movement some good may yet come out of it, but in the meantime one may be pardoned for doubting the genuineness of the whole affair. Industrial milleniums have been promised before but never except when the hidden foundation of the promise was more or less cunningly concealed in political ambitions. It is as unusual now as at any other time for a man to change his character in a day, or for the leopard to change his spots. At the same time all are willing to receive an agreeable surprise from Senator Hanna's committee.

Helping Pittsburg Out—The rumors concerning the possible sale of the Western Maryland railroad are of the deepest interest to Pittsburg business men whether as shippers of iron and steel or as officers of the centering railroads. That different interests are reported as active in the efforts to secure control of the property is immaterial. The meat in the case is that, regardless of the purchaser, the Pittsburg district seems certain to profit by having at its disposal another direct outlet in the matter of prompt shipments of products. Beyond that the community at large has no strong interest. This district has been the object of discrimination in freight conditions for so many years that the mere problem of ownership in a line of adequate transportation facilties and direct connections with other desirable railroad properties is a detail of such insignificance that it is lost sight of. In this case Pittsburgers may have a preference to have the Western Maryland fall into the hands of such a representative Pittsburg man as Charles M. Schwab but it goes without saying that any direct connection with the Atlantic seaboard through that road, or any other that may be available, will be as welcome in any other hands save those of the officials that control the transportation facilities that have hampered the freer development of Pittsburg and its contiguous territory, all essentially a part of this producing community.

OBITUARY.

AARON FRENCH—Aaron French, president of the A. French Spring Company, died Monday, March 24, at 12:15 A. M., at his home, 6826 Penn avenue. Mr. French had been ill for the past two months and his death has been expected for several days.

Aaron French was born at Wadsworth, Medina county, O., the son of Philo and Mary McIntyre French, March 23, 1823 and began an apprenticeship as a blacksmith at the age of 13 years. During his early manhood he was incapacitated for severe effort by physical infirmities for some years, and on recovering entered the employ of the Cleveland, Columbus & Lake Shore Railroad Company, at Cleveland. His first work for this corporation was the erection of the iron work of the Painesville bridge, and he remained in their employ until 1854, when he went to Norwalk, O.

Aaron French.

During the Rebellion he became associated with Calvin Wells and began the manufacture of vehicles and car springs in Pittsburg, the firm name being then as now, The A. French Spring Company.

Only ten men were employed at first, but more were added as the business grew, until it now embraces four full squares of the city, and employs several hundred men and boys. Several years ago the firm was incorporated, and Mr. French from that time forward gradually withdrew himself from the active management of the affairs of the company.

As a business man and as a citizen Mr. French identified himself with Pittsburg interests early after his coming to this city, and the years have but added to the weight of his influence among his associates and in those general affairs in which he always took an alert if not a conspicuously public interest. He was a member of the Duquesne club, of the Pittsburg chamber of commerce, and other commercial bodies, and also of the Masonic fraternity, Knights Templar and a number of similar organizations.

Mr. French's last business engagement was in the formation of the American Steel Spring Company, a combination of firms in his line of business with $20,000,000 capital. He was made president and a director of the company. His company was the largest in the combination.

Mr. French was twice married, five children being born of the first wife, Euphrasia Terril, of Liverpool, O., and three of whom survive. The second Mrs. French was Caroline B. Skur.

CAPT. JOHN LITTLE—Captain John Little, for 25 years night superintendent of the Edgar Thomson mills of the Carnegie Steel Company, died at his home No. 413 Holland avenue, Braddock, Thursday, March 21. Captain Little was born in Freeport 61 years ago. When little more than a boy he went to Johnstown to work in the mill. At the breaking out of the civil war he enlisted as a private in the Fifty-fourth Pennsylvania infantry, and at the close he was captain of his company. From 1866 to 1874 he was head roller of the Cambria iron works. In the latter year he came to Braddock with the late Captain W. R. Jones, and for 10 years was head roller at the Edgar Thomson works. In 1884 he was made night superintendent of the rolling mills, and later of the entire plant. He was obliged to resign three years ago on account of his health.

In 1868 Captain Little was married to Elizabeth George, of Johnstown. She and all their children, Richard D., a draughtsman for the United States Steel Corporation, Home stead; Charles D., also an employe of the steel company; James E., principal of the Braddock High school, and Elizabeth B., Mary G., and Alice survive.

JOSEPH FORKER—Joseph Forker, a pioneer iron manufacturer and banker, aged 73 years, died, March 19, at his home on East State street, Sharon, after a long illness from dropsy and heart disease. Mr. Forker was born and reared in Mercer. He was a son of General and Mrs. John Forker. In 1864, he went into the coal business in Hickory township and was successful. He was associated with many of the early manufacturing concerns of Mercer county, and was a director in the Spearman Iron Company for 30 years. In 1875, he organized the Sharon National bank, and served as president almost continuously. Mr. Forker is survived by one

son, D. M. Forker, superintendent of the furnace of the Republic Iron & Steel Company at Birmingham, Ala., and one daughter. Mrs. V. M. Delamater.

WILLIAM TREESE—William Treese, one of the pioneer iron men of Blair county and who was among the best-known forgemen of the early half of the last century, died, March 19, at his home in McKee's Gap, South of Hollid ysburg, aged eighty-two. During his active life Mr. Treese was employed as an iron-maker, having worked as a forgeman for the famous ironmaster —Dr. Shoenberger—who operated extensively in Central Pennsylvania in the first half of the last century. Later he was a trusted employe of J. L. Hartman.

SEBASTIAN RUNSER—Sebastian Runser of Sharon, father of Frank Runser, manager of the Mahoning Foundry & Machine Company, died a few days ago after an illness, covering four years. He was born in France, June 15, 1828, and came to America in 1832, first locating in Massillon, O., and then moved to Sharon in 1844. He was a blacksmith but later became superintendent of the Greenville rolling mill. He was one of the pioneer iron men of the Shenango valley and had been actively engaged in the iron industry until his health failed him.

A Mention of Men.

"American goods have found their way everywhere in Europe," said C. E. Lee a few days ago in this city. Mr. Lee represents Raymond Brothers Company, Chicago, makers of pulverizing machinery used in chemical works, on clay products, ores and in paint factories. He continued: "A salesman no longer has to argue about the quality of his goods that is already established, and they are accepted as the standard. If you ask for the best saw, for instance, you will be shown one of an American make. European manufacturers are now making goods to resemble American ones. We excel, perhaps, most in machine tools. They are of superior design and best adapted to the work for which they were intended. There is, of course, a patriotic prejudice against America, and the Admiralty, for instance, must place their orders at home, if this can be done, but there are ways of getting around this."

George Hargreaves, manager of the American Car & Foundry Company plant, at Detroit, said last Friday that the crush to get steel was the worst he ever knew. Said he: "Everybody seems overwhelmed with work. The ante-rooms of the offices were crowded yesterday with people busily studying long waiting lists. The officials of the companies are, of course, as anxious as anyone to expedite matters, but they are taxed to their limit. We come here for our angles, channels, bars and plates. Some orders placed here last summer are just being filled. This, coupled with delay in transportation on the road, makes our position when it comes to deliveries rather awkward to say the least. Some cars, for instance, which left here February 22 are still on the road somewhere."

James W. Cross, assistant manager of the locomotive department of the Great Western railroad, of England, and E. A. C. Coventry, one of his assistants, were in Pittsburg during the week. They are touring this country looking at the American railroad systems but are not giving orders for railroads equipment. They visited the various plants of the Westinghouse control and the Homestead plant. Speaking of the trip, Mr. Cross said: It seems to me that the only thing in which you excel in this country is the building of locomotives. The English do not build their engines so big nor so powerful as the Americans do."

F. R. Phillips, of Philadelphia, sailed this week for Europe where he will remain for some months during the execution of numerous iron and steel contracts placed abroad by F. R. Phillips & Sons Company. He takes a number of large buying orders and expects to place a heavy tonnage for future delivery. Mr. Phillips also expects to close contracts on several propositions covering the installation of modern American labor saving machinery for steel plants and rolling mills.

Earl Hanna, for the past three years chief engineer of the Dominion Iron & Steel Company, at Cape Breton, Nova Scotia, has assumed charge of the erection of the blast funaces of the Union Steel Company, at Donora. Mr. Hanna was formerly with the Carnegie Steel Company at the Edgar Thompson mills, and went to Cape Breton with a number of other experienced steel mill men to operate the works of the Dominion company.

Colonel William P. Tyler, of New York, president of the Tyler Tube Company, whose works are at Washington, Pa., was in Pittsburg during the week on business connected with the manufacture of tubing. "I went abroad for a pleasure trip last summer," said Colonel Tyler, "but the

pleasure was little. I spent several months in various hospitals, returning to New York in the fall much worse for the trip, instead of the intended improvement in my physique. I shall start across the Atlantic again in about a month, and I am hoping to see the countries and people this time."

At a recent meeting of the stockholders of the Alabama Steel & Wire Company, Cortland Van Camp, president of the Van Camp Hardware & Iron Company, of Indianapolis ,and John Bindley, president, of the Bindley Harwdare Company, Pittsburg, were added to to the directorate, which was increased from five to seven. C. E. Robinson, who has been litigating with the Schulers, is out and the Schulers and their friends are in undisturbed possession.

Paul S. Whitman, employed in the structural draughting room of the Cambria Steel Company, at Johnstown, has been made assistant to J. J. Davies, foreman of the structural shop at Franklin. Mr. Whitman takes the place W. P. Parker, who recently went to Cleveland.

Henry B. Shields, who has been genera manager of the Girard Iron Company, operating the blast furnace at Girard, O., has resigned and will leave for the South to take charge of the 450,000 acres of timber land in Louisiana recently purchased by himself and other parties.

Frank H. Czarniecki has retired from the firm of Smith & Czarniecki, general Pittsburg agents of machine tool companies, and will represent The Western Manufacturing Company's lathe, planer, and shaper tools, at 347 Fifth avenue.

J. K. Henry, formerly Pittsburg representative of the Philadelphia Pneumatic Tool Company, has associated himself with the Brown & Zortman Machinery Company, of Pittsburg, to look after the city business.

G. B. Walker, formerly connected with the Harrisburg Chain Company, Harrisburg, Pa., is at the head of a new concern to manufacture chain at Marysville, Perry county, Pa. The paid up capital of the company is $15,000.

James G. Lindsay & Company, Philadelphia, changed their office location, March 27, to 1019-20-21 Arcade building, Fifteenth and Chestnut streets, that city.

C. W. Lytle, Pittsburg, has succeeded E. E. McIntyre as the Pittsburg represenative of the Vulcan Foundry & Machine Company, New Castle, Pa.

Fritz Gleim has resigned as superintendent at the Everett Pa. furnace to accept a similar one withthe Rockhill Iron Company, at Orbisonia.

Car Service Report—The Pittsburg Car Service Association held its annual meeting in the general offices in the Westinghouse building Saturday. A. B. Starr, general su erintendent of freight transportaion of the Pennsylvania lines, was elected chairman, A. W. McIntyre, chief clerk to Robert Pitcairn, was chosen secretary. The executive committee, in addition to the chairman of the association, includes the following: Superintendent R. L. O'Donnell, of the Pennsylvana railroad; Superintendent Mitchell, of the Pittsburg, Virginia and Charleston; General superintendent G. W. Creighton, of the Buffalo and Allegheny Valley; General Superintendent W. R. Woodford of the Baltimore & Ohio; S. P. Hutchinson, superintendent of the Baltimore & Ohio; E. H. Utley, general manager of the Bessemer & Lake Erie; William Willock, general superintendent of the Mononaghela Connecting railway, and J. B. Yohe, general superintendent of the Pittsburg & Lake Erie.

The jurisdiction of the association includes Wheeling as well as Pittsburg. In the annual report it was shown that the number of loaded cars delivered to Pittsburg and Wheeling in 1901 was 1,768,921. against 1,810,634 for 1900. While the number of cars showed a decrease the tonnage was materially greater than the preceding year, which is due to the increase in the tonnage per car of the latest style of freight equipment. Approximately the tonnage delivered to Pittsburg and Wheeling during the year amounted to 54,067,730 tons.

Following is the number of cars inbound handled by the various local lines: P. R. R., 333,665; West Penn, 113,182; P. V. & C., 205,681; B. & A. V., 198,777; Fort Wayne, 208,215; Panhandle, 83,293; B. & O. 172,968; P. & L. E., 201,121; P. & W., 69,065; Pittsburg Junction 52,028; Pittsburg, Chartiers and Youghiogheny, 995; Monongahela Connecting, 109,026, and the B. &. L. E., 267. This report does not include the passengers cars handled.

Technical Bodies.

The next meeting of the Railway Club of Pittsburg, will be held at the Hotel Lincoln, Friday, March 28, at 2 p. m. R. A Park, of the Westinghouse Air Brake Company, will read a paper on "The Elasticity of the Friction Buffer" on railway equipment.

The papers presented at the February meeting, to be discussed, are the "Locomotive", by Ira C. Hubbell, and "Power in Railway Shops", by R. W. Stobel, Electrical Engineer, Pittsburg & Lake Erie Railroad Company.

IN AND ABOUT PITTSBURG.

The Westinghouse Electric & Manufacturing Company will furnish the power machinery for the Pittsburg, McKeesport & Connellsville Railway Company's plant. This will consist of three generators, each of 1,850 horse power capacity. The pumping and condensing plant, which will have a capacity of 600,000 gallons daily, will be installed by Henry Worthington, of New York. The engines, of which there will be three, will be vertical Allis engines and will be installed by the Allis Chalmers Company, of Milwaukee, Wis. The boiler plant will consist of two batteries, each containing six boilers with a total steam-generating capacity of 6,000 horse power. In addition to the coal and ash handling machinery there will also be installed a 30-ton electrically operated crane for use in handling heavy machinery. The cost of the plant will amount to almost $500,000, divided as follow: Building $100,000, engines, $110,000, electrical equipment $145,000, boilers $42,000, pumps and condensers $11,000, ash and coal handling plant, $5,000, crane $7,500. In addition to the main power plant there will be erected nine sub-stations along the line. The locations for these have not yet been definitely decided on, but they will cost in the approximately $5,000 each.

Charles T. Schoen spent a day in Pittsburg during the week and said as he started back to Philadelphia: "I shall return next week and on concluding the deal for a site we will begin at once to erect our works, which it will require about three months to complete. At first we will only make 300 wheels a day, but after getting thoroughly equipped expect to make 3,000 wheels daily. We estimate that there is a demand for 8,000 car wheels daily to keep equipped the 1,400,000 cars in service in the United States. While the first cost of our wheels will be a little higher than those at present in service our wheels will be as 3½ to 1 in mileage wear. The frogs in use in trackage preclude an increase in the size of the flange on car wheels and in order to get greater strength and durability, superiority in the wheel itself must be secured. We have expended $150,000 in building an experimental plant, which is turning out wheels."

The largest shipment of armor plate ever made from an American steel works left the Homestead mills last week for New York. It consisted of 36 plates, 18 for the first-class battleship Borsina and the same number for the first-class battleship Ariel, now building at the Imperial Russian navy yards at Kronstadt. The shipment was made on 18 cars of special construction, which were rushed to New York on express schedule. In addition to the heavy plates there were 35 tons of case-made taper plates, from four to six inches thick, and a large number of bolts, the whole weighing over 30,000 tons. The total represented six months work in the Carnegie plants and attracted much attention as it started on its journey on the Pennsylvania railroad.

The Bradley Manufacturng Company of this city, has awarded a contract to the Brown & Zortman Machinery Company, Pittsburg, for a large amount of machine tools to be installed in the new works to be built on Preble avenue, Allegheny. The order for a six-ton electric traveling crane was given to Pawling & Harnischfeger, Milwaukee, Wis. All the machinery will be electrically driven, the motors to be of the Bullock type. Several shapers and polishing machines are still to be purchased.

Contracts will be let this week for the foundations for the new plant of the McKeesport Manufacturing Company, McKeesport. The Fort Pitt Bridge Company, Pittsburg, will erect the buildings; Bass Foundry & Machine Company, Ft. Wayne, Ind., will furnish two 30x60 compound Corliss engines; the Stirling Company will install the boilers while the hot and cold mills will be built by the Wheeling Mold & Foundry Company, Wheeling.

The Allegheny city comptroller will receive bids until April 13 for furnishing two 15,000,000 gallon vertical, triple expansion, condensing, high duty pumping engines for installation at the Montrose pumping station; two 350 horse power water tube boilers for the same place; one 5,000,000 gallon pumping engine of the same type for the Howard street pumping station, with two 250 horse power boilers of the water tube type.

A number of Homestead and McKeesport men have formed the Keystone Foundry & Manufacturing Company and have bought the plant of the McKeesport Foundry, at Versailles and will double it and rebuild it for the manufacture of stoves and ranges. The new concern has a capital of $50,000. H. A. Monath, of Homestead is president and M. F. Risher, of Hays, secretary and treasurer.

The Tennessee Coal, Iron & Railway Company has purchased from the Pittsburg Filter Manufacturing Company, this city, a central gravity water softening plant of 25,000 h. p. capacity, to purify the water used in the boilers of the various industries at Ensley and Pratt City, Ala. This will be the largest single water softening plant in the United States if not in he world, and will be in operation about June 1.

The South Chicago Furnace Company, Chicago, Ill., and the Toledo Furnace Company, Toledo, O., have placed contracts for three large blowing engines, each, with the Westinghouse Machine Company. The contracts were placed through the office of Julian Kennedy, the well-known contracting engineer. The engines are to be arranged to run as compound, or separately. Each of the stations will have two high-pressure engines and one low pressure. The high pressure engines will have steam cylinders of 50-inch bore, fitted with the most modern design of Corliss valve gear. The low pressure engines will have a steam cylinder of 96 inches diameter, also equipped with Corliss valve gear. The air cylinders will be 66-inch.

Charles G. Smith Company, have succeeded Smith & Czarniecki as the representatives in Pittsburg and the surrounding territory within 100 miles radius of: The Safety Emery Wheel Company, of Springfield, O., grinding machine and emery wheels: Wilmarth & Morman Company, Grand Rapids. Mich., new Yankee twist drill grinders; George Gorton Machine Company, of Racine, Wis., disc grinding machinery; Eastern Machinery Company, of New Haven Conn., Frisbie friction pulleys and clutches; Hill Clarke & Company, of Boston, Mass., milling machines, radial drills, bath universal grinder, drill presses, etc.

The Standard Underground Cable Company has just received an order from the Manhattan Elevated Railway Company, of New York, for almost 60 miles of three conductor lead covered copper cables for use on the Sixth and Ninth avenue roads. The cables will be used in connection with the electric system to which the power of the roads is being converted. The order will keep the plants of the company busy for the next 90 days.

E. R. Caldwell & Company, of Bradford, Pa., have let the contract for an addition to their foundry to W. N. Kratzer & Company, through Edgar M. Moore & Company, of this city. The addition will be 90 x 220 feet and will be completed by June 1 giving an increased capacity of 100 per cent. The Whiting Foundry Equipment Company received the contract for a 20 ton electric traveling crane.

We are officially advised by the Fischer Foundry & Machine Company, South Side, that there is absolutely no truth in the statements appearing in the daily papers to the effect that a new plant would be built at Connellsville, Pa. The company is engaged doubling the size of its present machine shop in order to equalize the various departments.

Officers of the Stark Rolling Mill Company, of Canton, O., have been in Pittsburg in consultation with a local engineer with a view to having plans prepared for a new Bessemer steel converting plant at Canton. The company some time ago had plans drawn for the erection of two 35-ton open hearth furnaces, but it is probable now that a Bessemer plant may take their place.

A portion of the plant of the Mortin Hertzog Manufacturing Company, South avenue, Allegheny, Pa., has been leased by the Lloyd Manufacturing Company, recently organized, and is being equipped for the manufacture of milling machines, upon which the company has taken out patents. The plant will be ready for operation by April 1.

The Simonds Manufacturing Company, Twenty-fifth street and Liberty avenue, this city, reports an active demand for cut gears. The company is installing a planer, three hobbing machines and a lathe and is in the market for a small steam hammer. The offices will be removed to the second floor and the room vacated will be used as an extension to the machine shop.

The Fort Pitt Forge Company is building a 35 by 100 foot, one and one-half story addition to its plant in Liberty avenue near Twenty-sixth street to be used as a warehouse. The company has its forging and rivet deparment in full operation and will install a 2½ inch upset machine.

The Sharon Foundry Company. Sharon, Pa.. has awarded the contract for the erection of its new plant to Riter & Conley, Pittsburg. The main building will be 450 feet long and in addition there will be a pattern house, a storage house and the offices of the company. There will also be an electric power house, for the company intends to operate the plant as much as possible by electricity.

A diamond drill has been set up by the Rochester & Pittsburg Coal & Iron Company to test the coal on lands optioned by M. C. Watson, of Indiana, Pa., and Judge A. V. Parker, of Ebensburg, in Brushvalley township. If the test shows coal in paying quantities fields aggregating about 10,000 acres will be bought.

At a meeting of the chain manufacturers in the Hotel Lincoln, March 20, it was decided to advance the price of coil, crane, trace and wagon chains April 1. The advance is a material one running from a 5 per cent to as much as $4 per ton. Local chain manufacturers have not been informed of the change.

The firm of Scott, Low & Company, 407 Empire building, has been dissolved being succeeded by the Edgar S. Low Company. The firm is engaged in the railway equipment and contractors' supply business.

Work has been started on the enlargement of the armor plate plant at the Homestead steel works, Homestead. The new plant will cost nearly $8,000,000 when completed and will cover three times as much ground space as the present one. A new pattern-making and carpentry department is being erected at the plant, with a fireproof building for the storage of the costly patterns. The present armor plate machine shop will be transformed into a "protective deck" department of the armor works, a department which does not now exist at Homestead. The small press which is now in the forging department will be moved to the "protective deck" department. The removal of this press will make room for a new one which will have a maximum capacity of 12,000,000 pounds. being the greatest squeezing machine in America. It will be a mate to the one which is now in the forging department. The Harveyizing department will be enlarged and a number of new furnaces installed.

Announcement was made March 20 that the Sharon works of the Republic Iron & Steel Company, which have been idle since last Christmas on account of inability to procure pig iron, will be started within a few days. The supply of pig metal will be secured from the Hall furnace stock.

The plant of the McClintic-Marshall Construction Company, Rankin, shut down for a week because of an inability to get steel, resumed Monday. During the shut-down several alterations have been made to facilitate work and increase the capacity of the works.

It is understood that the stockholders of the A. Garrison Foundry Company, of this city, will soon take action on a proposed increase of the capital stock to allow for the enlargement of the company's plant.

The Director of the Department of Public Works, of this city, will receive bids until April 3 for the furnishing and erecting of 14 automatic stokers in the Brilliant pumping station.

NOTES OF THE INDUSTRIES.

B. T. Cartwright, superintendent of the tube and skelp mills of the Sharon Steel Company, Sharon, Pa., states that the new works are about completed, and will likely be ready for use by May 15. All that remains to be done is the installation of some machinery which has been purchased from Pittsburg concerns. The plant consists of a tube mill, skelp mill, and universal mill, the latter being the only one of the three buildings yet under construction. It will not likely be completed before the middle of July or August.

The American Car & Foundry Company has taken orders within the past few days for 4,500 freight cars and 74 passenger cars. It is said by an official of the company that the cost of building the new plant at Berwick, Pa., (about $500,000) will be met out of surplus earnings. The new plant will be for the production of structural steel freight cars. The earnings of the company are at a rate that enables the management to contemplate extensive new construction to be paid out of earnings in excess of dividends on both the common and preferred stock.

Contracts have been let and ground broken by the Standard Steel Company, at Burnham Pa., for two buildings of structural iron, 90x300 feet each, to be completed by September 1. They will be located between the new open hearth steel furnace and tin mill, and used as a foundry and casting room for soft iron castings, principally locomotive cylinders for the Baldwin locomotive works. This will be the initial step in the manufacture of cylinders at this works.

The Chambersburg Engineering Company, Chambersburg, Pa., has just made shipment of a large steam hammer to the new plant of the Colonial Steel Company, Monaca, Pa. It is the the second large hammer manufactured by the Chambersburg company and ranks among the heaviest ever constructed in the United States. It will require five cars to carry it to its destination.

The contracts for constructing a portion of the buildings to compose the Empire Iron & Steel Company's plant, at Niles, O., have been awarded to the American Bridge Company. The iron company will bring into use a large part of their plant several buildings which stood on the site selected. These buildings are all in first class shape and with but slight alterations will be in condition for use.

The United States Steel Corporation is making renewed efforts to assimilate the American Iron & Steel Company, organized two years ago with a capital of $20,000,000. It has five plants, three at Lebanon and two in Reading. The controlling interest is represented by J. P. Sternbergh, of Reading.

W. C. Runyon of Cleveland, president of the Struthers. (Ohio) Furnace Company, is considering the advisability of building a coke plant near the company's furnace in that place. The ovens are of the bee hive type. The company proposes to build 100 of them, having a consuming capacity of 350 tons of coal per day. The site selected is on property owned by the company near the furnace.

The Westinghouse Electric & Manufacturing Company has broken ground at Scranton, Pa., for the erection of a plant for electrical purposes which will cost $1,400,000. The plant will occupy part of the site of the steel mills torn down and removed to Buffalo and is in connection with the new rapid transit railroad now nearing completion between Scranton and Wilkesbarre.

James Rees, of Bellevernon, Pa., assistant general manager of the Youghiogheny & Ohio Coal Company, of Pittsburg, is at Bridgeport, O.. to arrange preliminary work for opening the largest mines in that county, to develop a tract of 11,000 acres of coal lands recently purchased. The company will build two miles of railroad to one opening, where a daily output, when in full operation, will be 2.000 tons.

The Standard Steel Company, of Burnham, Pa., has let contracts and broken ground for two buildings of structural iron, 90 by 300 feet each, to be located between their new 50-ton open hearth steel furnace and tire mill. The buildings will be used as a foundry and casting room for soft iron castings, principally locomotive cylinders, to be used by the Baldwin locomotive works, Philadelphia.

It has been positively annoucned that the Youngstown Manufacturing Company, Youngstown. O., will build a rolling mill in connection with the nut, bolt and rivet works at Struthers. The manager of the mill will be S. B. E. McVay, formerly of the Republic Iron & Steel Company, and lately of Muskeegon, Mich.

Kendrick & Roberts, Philadelphia, have been awarded the contract for the erection of the Lackawanna Iron & Steel Company's new plant, at Buffalo, N. Y. The main building will be 667 x 120 feet and in addition there will be an engine house, a blower house, a pump house and a Bessemer steel building.

The Brown Gas Engine Company, Columbus, O., has formed an alliance with the Cochran Company, Lorain, O., and hereafter the Brown gas engine will be built at Lorain. It is understood that it is the intention of these companies to build new and larger quarters.

The Harrisburg Foundry & Machine Works, Harrisburg, Pa., has received a contract from the Astor estate, New York city, for four of the latest pattern of four-valve engines, aggregating 15,000 horse power, to be installed in a new hotel to be built by the state.

The Wellman-Seaver Engineering Company, Cleveland, O., has changed its name to that of the Wellman-Seaver-Morgan Engineering Company. As has been stated in these columns before, the company will manufacture a general line of machinery for iron and steel manufacturing plants.

The National Machinery Company has been incorporated in New Jersey with a capital stock of $450,000. The incorporators are Augustus Rohn, Louis Selle and Amandus Bettes, Tiffin, O.; Harry M. Reynolds, Dayton, O.; Mesheck Frost, Toledo, and Francis B. Lee, Trenton.

The Forsythe Pattern Company, Youngstown, O., has bought the property of the American Can Company at that place, and will enlarge its business. The company will be incorporated under the laws of New Jersey, with a capital stock of $100,000.

Plans for three new mills are being made by the American Steel Hoop Company, Youngstown, O. Where the mills will be situated will be determined within the next 30 days. The mills will be an 18 inch and a 10 inch mill.

Wickwire Brothers, Portland, N. Y., have given an order for a pair of 30x36 inch geared reversing engines. The contract is distinguished in the fact that it is the only one for engines in America, the others having gone to foreign builders.

Henderson & Company, Philadelphia, will build a one-story brick addition to the Philadelphia pumping station, 54 by 52 at Shawmont and Minerva avenues. It will cost $21,000.

John R. Wiggins, Philadelphia, has signed the contract for the Philadelphia Electric Company's new power-house. It will be of brick, three stories in height, 190 by 166 feet, and will cost $300,000.

The Cleveland Frog & Crossing Company, Cleveland, O., will soon construct a brick factory at a cost of $5,000. The building will be 50x90 feet.

The Winton Automobile Company, Cleveland, O., has bought a 10 acre tract of ground and will build a plant, plans for which are now being prepared.

The British Westinghouse Electric Company has secured a contract to erect an electrical power station for the Metropolitan railway.

The McClintic-Marshall Construction Company, of Pottstown, Pa., has begun erecting its new steel casting plant at Birdsboro.

The announcement has been made that the Lackawanna Railroad, Scranton Pa., has completed preparations to build new car shops at a cost of $800,000.

The Continental Iron Comany, Sharon, Pa., will make improvements to its plant, adding a merchant mill and installing other machinery.

Work on the new addition to the plant of the Diamond State Steel Company, Wilmington, Del., will soon be commenced.

The Board of Trade, Fairmont, W. Va., is endeavoring to secure a tube company, now located in Ohio, to establish a plant in that place.

It is understood that the new tube mill of the Wheeling Steel & Iron Company, Wheeling, W. Va., will be ready for operation in about six weeks.

A new pattern shop 46x150 feet is to be built at the plant of the Midvale Steel Works, Nicetown, Philadelphia, Pa.

The Sharon furnace at Sharon, Pa., will more than likely blow in some time during the present week.

The Taylor Iron & Steel Company will build a 200-foot addition to its large plant at High Bridge, N. J.

The Shenango Machine Company, has decided to add a 200-foot addition to its plant.

WEST VIRGINIA NEWS.

The La Belle Iron Company, operating mills at Wheeling and at Steubenville, will hold a special meeting in a couple of weeks to increase its capital stock from $3,500,000. to $5,000,000. The intention is said to be to enter the structural steel business adding largely to the Steubenville works. The company's new tube plant there is doing good work.

Senator Stephen B. Elkins and Ex-Senator Henry G. Davis have secured options on 25,000 acres of coal land in Lewis county. This strengthens the belief that a new road to connect the Little Kanawha with the West Virginia Central will be put through Lewis county via Weston.

George Wooster. Andrew Edminston, Dr. George I. Keener, J. Vandervoort. W. W. Brannon, and J. H. Edwards and others have bought the Weston brick works. Pressed brick machinery will be installed and other additions made.

A peculiar formation of coal at Bluestone Junction, W. Va., is being tested by the United States Steel Company in the manufacture of bricks for coke ovens. It is said to produce bricks longer lived than the best fire bricks.

J. G. W. Davies, of Grafton, has begun construction on buildings for the Beaumont glass factory, which will be removed to that town from Martins Ferry, O. The main building will be 300 by 30 feet, with numerous annexes.

The B. & O. has abandoned plans for a steel bridge across the West Fork river at Lumberport, and will connect its Short Line and Monongahela river division at another point.

Two large mining plants, in which Comptroller H. D. Buckley, of the B. & O. is principal projector, will be installed near Wolf Summit. to develop a tract of coal.

Major R. Snowden Andrews, of Baltimore, got $75,000 for the coal under his 1,000 acre farm near Clarkbsurg.

May Resume Operations—The Hartman Manufacturing Company, of Ellwood City, may be allowed by the receiver appointed by the United States court to resume the manufacture of wire nails. The Union Trust Company, of Pittsburg, is the receiver appointed by the court. A proposition has been made by New York and Chicago banks and trust companies, creditors of the Hartman Manufacturing Company, to restore the plants of the involved company to independent operation if President F. A. Umstead, Secretary W. L. Kiefer and others interested will consent to allow E. A. Henry to assume entire management of the concern and its affairs.

E. A. Henry is president of the Cuyahoga Steel & Wire Company, of Cuyahoga Falls. Umstead and Kiefer, after purchasing the origina Hartman plant at Ellwood City, secured the buildings of the Shelby Tube Company, at New Castle, and were proceeding with plans for greatly enlarged operations, including the purchase of the Cuyahoga Falls plant, when the halt was called by those to whom the concern was indebted and the receiver appointed. Among the banks interested are the Hanover National, Second National, and other national banks of New York, and the City Trust Company, of New York.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The material improvement in the car supply is giving considerable ease to the blast furnace operators but the influence has not reached the steel finishing plants That it will extend to them within a short time there is no doubt and when that stage is at hand the difference in the general market conditions will embrace probably 10 per cent in the productive capacity. The percentage may not run so high in the largest of the steel plants but will not be less at the blast furnaces and probably the billet plants. The blast furnace operators report that they are getting all the coke they require which is the first instance of that character since last summer. If the loss because of the various misfortunes was 10 per cent, of course the percentage recovered will not be less than that amount. The run of cars for all purposes has improved as well as for the shipments from the Connellsville coke reigon but there is not the same satisfactory results in other departments. There are cars enough for everybody but loaded trains are clogging up the sidings from one extreme of the country to the other so that the mere fact that there are cars enough in which to put iron and steel, bears no relation to the small quantities of material that is being delivered to consumers.

There is no more ease in the general congestion than formerly and while the pressure upon prices may be less after July 1 there will be no actual changes. The 10 per cent which will be added to the general pig iron market will not be of real benefit to the stranded consumer but will be turned over to those regular customers of the furnaces who have been held back on short allowances. To that extent there will be an easing but the general run of consumers will not benefit. For that reason there will be no easing in price during the year, barring financial disaster.

The straining after pig irons continues and solid premiums are offering for prompt shipments of small lots. During the week 5,000 tons of standard Bessemer were sold for as high as $17.50, at valley furnaces, while mill iron still holds rigidly at a minimum of $18 with plenty of willing buyers at the figure. These rates are for small lots, as large shipments are out of the question. The nominal quotation on Bessemer billets is $31.50 but almost any price the holder may ask would be paid. The only problem is to get the billets.

In the finished lines the old conditions also obtain but with the prospects slightly better. The car supply for that use is cutting down the piles of materials that have hampered production for some time but the trimming process is slow. The principal improvement is that the production is not badly hampered but on the other hand there is not much doubt that if the piling of stock in the mill yards was not necessary the plants would turn out much more steel.

The importations and reported importations of pig irons and billets from Germany are not giving the Pittsburg producers concern because up to date the opportunity to import has not been satisfactory. It is doubtful if the question of importations would be regarded as a danger in any sense if the consumers were able to bring over from Germany or elsewhere enough steel to relieve immediate wants. As the situation stands today there is not much prospect of extensive importations of any material at any price.

CURRENT QUOTATIONS:

Basic	$17 25		Splice bars	1 50	
Bessemer		18 25	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	18 00		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 69	1 70
Fdy 3, Shn	16 15		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	15 60		No. 1 wrought	20 00	20 50
Bessemer billets	31 50		No. 1 cast	17 00	17 50
Open hearth	32 00		Iron rails	25 00	26 00
Steel bars	1 50		Car wheels	18 00	19 00
Iron bars, refined		1 90	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—Prices for iron and steel have changed very little during the past week, but they are very strong at the highest point yet reached. Raw and finished material for prompt shipment sells for considerably more than is indicated by quotations, and it is likely that the average sales of the past week on all grades of material were at the highest figures yet realized, although quotations are practically the same as they were at last report.

As compared with a week ago, the local pig iron market has gained still further in firmness, and the continued difficulty of commanding prompt deliveries has stiffened prices to some extent. At the present time the shortage is the dominating feature, and it is especially effective because of the thorough exhaustion of stocks. All grades of iron are equally scarce, and it naturally follows that prices are irregular. Higher figures are asked for March and April shipments, but the extreme range for the standard brands of Northern iron at Phialdelphia or nearby points would be about as follows:

No. 1 foundry, $19.25 to $20 for shipment to July and $18.50 to $19 for the last half of the year: No. 2 foundry. $18.75 to $19.50, and $17 to $17.50; gray forge, $17.50 to $18, and $16.75 to $17.25.

There is very little being done in the steel billet market. Prices are very hard to quote, as there are but few sellers. The German steel purchased some time ago is beginning to arrive. No new orders are being placed abroad on account of the spurt of the prices in Germany and elsewhere.

Finished iron and steel products continue in urgent demand and deliveries for various causes are as hard to get as any time for some months. This is particularly true of structural material, the mills being simply gorged with tonnage and sold up for six to eight months. Plates are now in active demand and the market is considerably firmer than it was a week ago. Bars are also in better request and prices are gradually seeking a higher level. On all new business the price is $1.60 as a minimum. A good deal of tonnage is being placed for sheets, and, as a rule, the mills are well filled up with orders. Quotations are nominally unchanged, but in most cases considerably more is necessary to secure anything like reasonable attention.

It is reported that the mills have taken some orders for steel rails for delivery during next year. Prices are as follows: 200 ton and larger lots in standard sections, $28 a ton; $30 for car lots and $32 for less than car lots; $35 for rails weighing 30, 35, 40 and 45 pounds to the yard: $36 for 25 pound: $37 for 30 pound; $38 for 16 pound and $40 for 12 pound.

CURRENT QUOTATIONS:

Foundry, 1	$19 25	20 00	Girder rails	32 00	32 50
Foundry, 2	18 75	19 50	Angles, 3" & lr'gr		1 80
Gray Forge	17 50	18 00	Under 3-inch		1 90
Bessemer billets		33 00	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York — Rodgers, Brown & Company— Producers of iron are practically unanimous in the feeling that prices ought not go higher. They are not unduly high in leading lines of consumption, and there is no proof as yet that new enterprises are halting because of construction cost—at least so far as iron or other metals are concerned. Where the point would be reached that would put a check on the country's demands no one can tell, but every branch of the trade is interested to see that that point is not reached.

Except for occasional purchases of spot iron at fancy prices, the aggregate tonnage of which is trifling, ruling figures are moderate—certainly not above those of other staple products used by the people. They are still 20 per cent below the prices of two years ago. That they are remunerative to makers should not give undue concern to consumers who practically enjoyed five years of use of iron and steel in this country at or below real cost of production.

Inquiry fails to show that buyers thus far have, to any extent, overbought under the influence of fear to securing a needed supply. Certainly there is no occasion for undue alarm on that score. The depression in English and German markets is as marked as the activity here, and the foreign product can be can be laid down in quantity as but little above the current home prices. There is therefore, a good check against further advances and short supply, unless foreign markets revive. Buyers who follow the rule of covering for actual contracts taken and trusting in the markets for the remainder, will not likely suffer unduly.

The buying of the week has been confined to deliveries in the third and fourth quarters, except small lots here and there for early shipment, which have commanded fancy prices. There was a rumor that Alabama funaces were about to announce an advance of $2.00 per ton, but this action if taken, has no special significance, for the $12.00 Birmingham basis, ruling for several weeks, has been nominal only. Such Alabama iron as has been available for deliveries before July has sold in the past ten days at $14.00 and upward.

CURRENT QUOTATIONS:

No. IX fdy Nohn Jersey City	$19 50	
No. 2X fdy Jersey City	16 65	
No. 2 plain Jer. C.	17 65	
Sohn. 1 fdy N. Y.	18 75	
No. 2 fdy N. Y.	18 00	
No. 3 fdy N. Y.	16 50	
No. 1 soft	15 75	
No. 2 soft	17 00	
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40
Sheets, blue annealed, 10	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00
Plates ¼ and heav	3 15	
Ship & tank plate, on dock	2 50	2 50
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10
Beams and chan'ls 15-in & under	2 00	2 50
Angles	2 00	2 50
Tees	2 00	2 50
Zees	2 00	2 50
Time deliveries, basis $1.75 for angles, beams and channels.		
Com. base, bars per 100 lbs.	1 65	1 70
Refined base, bars	1 85	1 90
Bands, base	2 40	2 50
Norway bars	3 75	
Norway shapes	4 25	
Old T rails, iron f. o. b. cars	20 00	21 00
T rails steel f o b c	16 50	17 50
No. 1 wro't scrap iron f o b cars	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes	13 00	14 00
Old car wheels, f. o. b. cars	16 00	17 00
Old ham. car axl's f. o. b. cars	22 00	23 00
Wrought turnings deliv. at mill	11 50	12 00

Cincinnati — Nothing of importance has transpired in the pig iron market in the past week. The main business is to got forward the iron already sold. Consumers who require small lots can get what is absolutely necessary by pay-

ing a good premium on current quotations.

At the meeting last week of the Southern furnace operators, they concluded that as they had no iron to sell, there was no need to change the present quotations. There is improvement in the car situation, which is good news to all.

Shipments are being made in much larger volume and the railroads are handling cars with much more celerity than for some months past. Consumers will soon begin to see an end to their troubles in getting deliveries on materials purchased. In the South the situation is, of course, better than in the North, for there have been almost enough cars in the South during all of this month, but affairs are so much better in the North that already the great strain has been relieved. However, the main question is still in regard to shipments. Consumers have fallen behind in their work, and they are pushing the furnaces to the utmost. Of course, there are occasional requests to hold up shipments, but most consumers are doing their best to make up for lost time. Southern iron has been sold on a basis of 2.268 pounds to the ton. On all future sales the ton will be 2,240 pounds.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$16 75	Standard Sections	29 90	30 90
South fdy. 2	14 75	16 25	Sheet, 26	3 40	
South. fdy. 3	14 25	15 75	Sheets, 27	3 50	
South. fdy. 4	13 75	15 25	Sheets, 28	3 60	
Grey forge	13 75	15 00	Angles, 3 to 6 in	1 70	
Mottled	13 50	15 00	Angles, 1¼ to 2½	1 82	
Shn. 1, soft	15 25	16 75	Beams and Chanls 15 in and under	1 70	
Shn 2, soft	14 75	16 25	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	18 10	18 75	Tees	1 75	
L. Superior, 2	17 60	18 25	Z's	1 70	
L. Sup'r char'l c w	21 00	22 00	1 wrought scrap	14 00	15 00
Hang'g r'k ccl, 1	22 50	23 00	Steel mlting stock gross ton	13 00	14 00
Sohn ccl c w	20 35	20 60	No. 1 cast	12 00	13 25
Jaksn cy. silv'y 1	18 35	18 60	Old iron rails g t'n	18 50	19 50
St'l brs base hlf ex	1 72		Old car wheels	15 25	16 00
Iron bars	1 82		Cast borings	6 50	7 00
Flange plates	1 80		Turnings	7 00	7 75
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

Chicago—One of the largest pig iron melters in the West, a large implement maker, put out an inquiry for 5,000 tons of pig iron a few days ago, and it is reported that he did not receive a reply. One partial explanation is that the specifications were quite severe, but the more weighty reason is that there are few, if any, sellers for a quantity so large as 5,000 tons for early shipment. The market has not changed in its general features this week. Producers are extremely cautious in offering iron and there is a limited amount of trading at an advance of about $2 over nominal quotations. Prices of Southern iron below are for spot shipments in this small way.

The bar movement so conspicuous for two weeks past is fairly well continued this week and the steel mills are now said to be well supplied with orders for the last half of the year. Most of the Western users have covered for at least a large part of their expected wants, getting in on the basis of $1.65. Chicago, before the expected advance of $2 per ton April 1. There continues also fairly brisk trade in sheets, plates and other finished products for the same consuming manufacturers. Prices are without quotable change but are quite firm. Stocks of finished metals in store are quite low.

There is a feeling that the market for scrap has about reached its height and that the next development will be towards an easier condition. But quotations are very irregular and the range of values is somewhat higher. More scrap is appearing but not in quantities sufficient to glut the market.

CURRENT QUOTATIONS:

Bessemer	18 50	19 50	Sheets, 26 store	3 25	3 30
Fdry Nohn 1	18 00	19 00	No. 27	3 35	3 40
Northern 2	17 50	18 50	No. 28	3 45	3 50
Northern 3	17 00	18 00	Angles	1 75	
Southern 1	17 65	18 15	Beams	1 75	
Southern 2	17 15	17 65	Tees	1 80	
Southern 3	16 65	17 15	Zees	1 75	
Forge	16 15	16 65	Channels	1 75	
Charcoal	20 50	21 00	Steel melt'g scrap	16 50	17 00
Billets, Bessemer	31 00	33 00	No. 1 r. r. wrought	19 00	20 00
Bars, iron	1 85	1 90	No. 1 cast, net ton	14 50	15 00
Bars, steel	1 75	1 80	Iron rails	24 00	25 00
Rails, standard	28 00		Car wheels	18 00	19 00
Rails, light	32 00	34 00	Cast borings	8 00	8 50
Plates, boiler	1 90	2 00	Turnings	13 00	14 00
Tank	1 75	1 80			

Birmingham—A featureless iron week has gone by, the only sensation of the period being a report that the Southern operators would meet and advance the price of pig iron from one to two dollars per ton. No such advance materialized and the dispositin of the makers still appears to keep the market on a basis of twelve dollars a ton for No. 2 foundry. The sales were not large last week, the inquiry being good but the furnaces as yet unable to see their way to sell ahead of what is already booked. Spot iron brings thirteen dollars a ton for No. 2. A feature of the week was the visit to the Birmingham district of George de Szogeny, Royal Hungarian Commercial Commissioner, who spent several days looking over the steel mill and furnace plants, but had absolutely nothing to say of the nature of his mission except that it was to gather data.

The annual meeting of the Sloss-Sheffield Steel & Iron Company held during the week brought no changes except the election of Joseph Bryan, of Richmond, Va., as first vice-president, General E. W. Rucker, of Birmingham, the only vice-president heretofore, being retained as second vice-president, and the addition of A. B. Andrews, of the Southern Railway, to the directorate, succeeding F. W. Scott, of Richmond.

Coke is scarce in spite of extraordinary pains to supply the deficiency. Several hundred negroes were imported into the district last week to work on the coke ovens. The output of pig iron

will soon be increased by the blowing in of the idle Sloss-Sheffield furnaces at Birmingham and Sheffield, and the commencement of operation at the new Thomas furnace of the Republic Iron & Steel Company. The pipe foundries and rolling mills are running on full time with triple shifts at the Birmingham rolling mills.

A number of new enterprises are on foot, principal among which is the rolling mill for rolling large shapes being projected by John D. Dwyer, former superintendent of the Birmingham rolling mill, the Southern Rolling Mill Company, in which James Dwyer, W. L. Sims, Ben Catchings and others are interetsed and the Warrior River Light & Power Company, capital $1,000,000, which proposes to harness the water power of the Warrior river, manufacture gas, furnish water, etc. Among the incorporators are R. R. Zell, John L. Burns, J. R. Adams, Charles J. Zell, all of Birmingham, and A. L. Ezell, of Ensley. Principal among the enterprises prepared by the new concern is a street railway system connecting Birmingham with Ensley, Bessemer, Pratt City and other outlying industrial suburbs.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn.....	$12 50	13 50	Tank.....................	1 80	
No. 2 fdy, Sohn.....	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn.....	11 50	12 00	No. 1 wrought......	14 00	
Grey forge, Sohn..	11 00	11 50	No. 1 cast.............	12 00	
Billets...................	28 00		Iron rails.............	16 00	
Iron bars.............	1 70		Car wheels...........	15 00	
Steel bars............	1 70		Cast borings.........	6 00	
Light rails............	38 00		Turnings..............	6 00	
Angles..................	1 75		No. 26 sheets.........	3 00	3 50
Boiler plates.........	1 90		No. 28 sheets.........	310	3 50
Fire box...............	2 00				

Coal.

Pittsburg—The prospective early shipments of coal to the lake ports has temporarily banished the disagreements over details in the mining wage scale and it will be adjusted in private at an early date if it has not already been accomplished. The prompt adjustment of the freight rates and mining scale was a material assistance to the trade but the effect will be to visibly shrink the supply for purely local consumption with probably corresponding higher prices.

Cincinnati—Coal dealers are all back at the prices that held before the recent advance of 50 cents a ton. There has been a small amount of coal in from Kanawha, and promise of more from that district as well as a good run from Pittsburg, which will be made possible by a good stage of water. Some of the dealers did not advance the price of coal at all, and all of them are making the same price at which coal has been selling all winter.

Cleveland—The squabble and scramble that overlook the vessel men in the ore situation seems to moving down upon the carriers, in the coal trade. The early shipments projected to and from the head of the lakes has injected considerabe excitement among the carriers and the matter of rates and dock costs is in hand for early settlement. The dock laborers have been offered last year's wages and while there has been considerable grumbling it looks now as if there will be no strike as threatened a few days ago.

Chicago—Matters are lining up in a way between Eastern and Western producers on competitive business. The Eastern roads have made a reduction in freight rates to $1.50 from Pittsburg, the old rate being nominally $1.75, with corresponding reductions from West Virginia and Ohio, effective April 1. Western rates are held in abeyance until it is fully determined what the prices of Eastern coals will be. It is the general opinion that they may be slightly higher than last year, especially on lake trade.

The question will probably be decided this week. The present bituminous trade in the West is very heavy. There is no end to the supplies on track, mostly Western fuels, but an increasing number of Eastern products are getting in quite comfortable supply. There is hesitation both on the part of the producers and buyers in closing contracts for fuel for the year beginning April 1. Coke continues scarce but the tendency is towards an easier supply.

Coke.

Every condition connected with the production and movement of coke for the week showed improvement except the shipments to points West of Pittsburg which had a loss of 488 cars over the preceding week. But production and all other shipments were increased. The number of active ovens was added to the extent of 76 ovens.

The good weather aided in the increase in production, which, though slight when compared with the total, was of material advantage when it is remembered that within the past two weeks the increase in shipments has amounted to 2,000 cars, in round numbers. The Masontown field has increased shipments 200 cars in the same time, so that while the increase for this week was not so strong when compared with the preceding like period of time, amounts to considerable.

The relatively heavier shipments that production is explained by the fact that there was so much coke accumulated at the ovens that when the weather and the railroad companies permitted, the movement of fuel to consuming points took on a rushing activity that has

brought smiles to faces all around. While the total number of cars shipped was less than for the preceding week the loss came solely through the shrinkage in the Western movement.

Unless in the event of the unforeseen once more, the remainder of the year promises to eclipse all former productive periods in the matter of tonnage turned out and shipped to consumers.

A summary of the Connellsville region for the week shows 20,535 ovens in blast and 1,751 idle.

The following figures show the scope of operations.

Production for the week	221,461 tons,
" last week	217,401 tons.
Increase	4,060 tons.
Shipments—	
To Pittsburg and river points	3,869 cars.
To points West of Pittsburg	5,735 cars.
To points East of Everson	1,740 cars.
Total	11,344 cars.
Last week	11,650 cars.
Shipments in tons for week	250,998 tons.
" " " last week	257,740 tons.
Decrease	6,742 tons.
Masontown Field	
Shipments for week	664 cars.
" last week	467 cars.
Increase	197 cars.
Shipments in tons	17.264 tons.
" last week	12,162 tons.
Increase	5,102 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75. St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50 Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including March 24, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS
Transit	564,404	360,994
Tidewater	141,927	79,863
Southwest	42,754	211,201
Eureka	24,3C7	757,811
Buckeye, Macksburg oil	2,4·4	293,224
New York Transit	286,302	
Southern	392,661	....
Crescent	137,130	....
Total	1,693,060	1,109,800
Daily averages	77,959	74,343

LIMA.

Buckeye / Indiana Local Division	1,364,966	1,129,475
Daily average	59,346	49,107

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana
March 19	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
March 20	1.30	1.15	1.15	0.83	0.80	0.80
March 21	1.30	1.15	1.15	0.83	0.80	0.80
March 22	1.30	1.15	1.15	0.83	0.80	0.80
March 24	1.30	1.15	1.15	0.83	0.80	0.80
March 25	1.30	1.15	1.15	0.83	0.80	0.80

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 10 c
Copper, light bottoms	8 c
Heavy Composition	9 to 10½ c
Brass Turnings	6½
Heavy Brass	7 to 7¼ c
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	$3.00
No. 1 Pewter	16

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight, 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4.75.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots......37c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ......35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ......33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ......35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots......35c. pr. lb.	1000 lb. to ton lots...... 29c. pr. lb.
100 lb. " ......30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat stripe, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lot of 100 pounds, $1.10 per lb.; special price on large lots.

The Metal Markets.

LONDON—Tin—£117-£115 Sales, 300 tons spot; 1140 tons futures.

Copper—£53 7s-£51 15s Sales, 975 tons spot; 1,700 tons futures.

Lead—£11 10s- £11 7s 6d.

Spelter—£17 15s.—£17 10s.

NEW YORK—Tin—$27.12½-$26.25.

Copper—Lake. 12½; electrolytic, 12⅜; casting 12⅜-12¼.

Lead—$4.15.—4.10

Spelter—$4.35-$4.32½.

ST. LOUIS—Lead—$4.02½-$4.

Spelter—$4.12½-$4.07½

Ore Situation at Cleveland.

The week closes without a change in the rate situation. During the week, however, the situation has been made more complex by the announcement of a contract having been placed for 1,200,000 tons of ore at seventy-five cents a ton. This has been the mystifying affair of the season, and one which vessel owners are at a loss to account for. There are new forces at work with which the vesselmen will have to cope later on. What they are at present is a serious question. The shippers are complacent and easy going, having faith in the ultimate outcome of the controversy with the vesselmen, and this fact is making some of the owners uneasy, as it immediately puts them on the aggressive. Whether there has been an iron-clad understanding among the big shippers is a question which many will try to solve. Also whether some of the shippers have secret understandings with some vessel owners is another perplexing question. It is apparent to the vessel owner and to the marine man in general that something of this sort is hatching, but the full scope of the deal has not been encompassed. Some such solution as this is the only thing that will satisfy the average marine man now. A. B. Wolvin is a clever manipulator of rates, yet his word is the equivalent of a bond. No one would think of questioning it for a moment. He said a short time ago that a certain amount of ore has been covered for the season at seventy-five cents. No one can find the boats. The only possible solution therefore is that a deal is on in which the average man has not been included. Many other indications point to the same conclusion. In the meantime the market is unsettled, and many are uneasy as to the outcome.

New Machine Company—The Iroquois Machine Company has just been incorporated as a New York company. It was organized by W. W. Gibbs who is also vice-pesident of the Kidder Press Company, and a member of Gibbs-Brower Company, of New York city. The officers are Edwin A. Smith, president, Providence, R. I.; W. W. Gibbs, vice president and general manager, New York; Henry C. Babcock, secretary and treasurer, Providence, R. I. The principal office is at 150 Nassau street, New York.

The company will manufacture wire drawing machinery and a full line of automatic and plain drop hammers, swaging machines, rolling mills, roller bearings and grinding machines. The company has bought the plant and business of the Universal Machine Company, Providence, and rented a large additional building adjacent. The purchase of this running plant, and the addition named will insure the prompt filling of orders. The company has in contemplation the erection of a new factory building during the coming summer.

Manufacturers' Convention—Announcement is made by President Theodore C. Search that the seventh annual convention of the National Association of Manufacturers will be held in Indianapolis April 15,16 and 17. Local arrangements for the convention are being made by a committee of Indianapolis business men under the leadership of D. M. Parry, for many years a member of the executive committee of the association and a particularly hospitable welcome to visitors is assured. Members of the association are manifesting rather more than usual interest in this year's convention and there is promise of an unusually large attendance from all parts of the country.

President Search announced at Detroit last year when he consented to accept the presidency for the sixth time, that he could not serve the association in that capacity beyond the expiration of the present year. During the six years of Mr. Search's presidency the membership of the association has increased from less than 200 to more than a thousand and a vast amount of hard work has been done to promote the interests of the manufacturers of the United States. The National Association of Manufacturers was organized in Cincinnati in 1895, and its annual conventions have been held in Chicago, Philadelphia, New York, Cincinnati, Boston and Detroit.

President A. W. Thompson and Treasurer J. F. Taylor, of the Republic Iron & Steel Company, spent several days in Birmingham last week, during which time they reiterated the statement that there were no definite arrangements made for the erection of a steel mill at Thomas, although it is still in contemplation.

Moving Surplus Ore—Pennsylvania ore carrying lines are making effort to clear the ore docks of lake ports, in anticipation of lake traffic April 1, which gives promise of breaking records in the bulk of ore and coal handled.

January 1 the docks contained 1,700,000 tons of ore for shipment to the Pittsburg district and into the valley district of Ohio. During January and February 280,000 tons were moved and by April 22, when the new season's activity will begin at Erie, Cleveland and Ashtabula, the docks, it is hoped, will be cleared of the old stock. March 1 the Pennslyvania lines docks held 620,000 tons at Ashtabula, 565,000 tons at Cleveland and 275,000 tons at Erie. The average daily movement is now 50 cars from Erie, 150 from Ashtabula and between 80 and 90 from Cleveland. About half of the shipments are to the valley furnaces of Ohio, of which there are 29. The heaviest Pittsburg consumers of ore over the Pennsylvania lines are Bessemer, 6 furnaces; Duquesne, 4; Carrie, 6; Jones & Laughlins and American Steel & Wire Company. The Erie & Ashtabula is the heaviest transporter of ore in the lines as it reaches two ports. The Cleveland & Pittsburg comes next.

The limestone traffic of the Northwest system, Pennsylvanila lines, assumes activity and importance coincident with the shipment of ore. In this traffic the P. Y. & A. has become an important road, as well as the new road known as the Wolf Creek branch. This extends from New Castle to Stoneboro, penetrating an extremely rich limestone field. This road was chartered by the Sharon Steel Company, at Sharon, and subsequently secured and completd by the Pennsylvania Company. The demand per year by the Sharon Steel Company is half a million tons of coal and limestone hauled by the lines. The prospects are that every line available will be needed by the Pennsylvania lines for the season's demand for ore and limestone and that all motive power, old and new, will be taxed to haul the impending avalanche of these materials, which will begin to move next month.

Treating Iron Scrap—A method of treating iron scrap has been devised by Marcus L. Sly, of Medina, N. Y. A compound is prepared, composed of oxide of aluminum and oxide of iron in a powdered or finely divided state, thoroughly and intimately mixed, and pound for pound in proportion. A plate of old sheet or scrap iron is laid flat upon the coke in a cupola, and upon this a layer of the compound, and upon the compound a charge of fuel. Upon this charge of fuel is imposed another sheet of iron, upon which is placed a layer of the compound and a charge of fuel, this alternate order of arrangement of the plates, the compound and the fuel, being maintained, until the desired charge has been placed in the cupola. The fire and blast are kept up until the entire mass is melted, after which it is drawn from the cupola in the usual manner. Sheets of scrap steel may be similarly treated and the inventor claims a result giving value higher than under other methods.

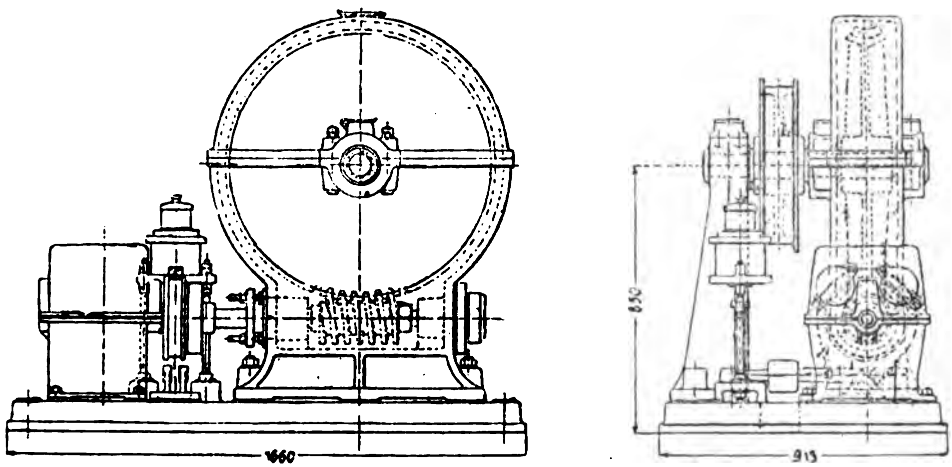
Local Concern Expanding—W. N. Kratzer & Company, structural and ornamental iron workers, have bought a plot of ground 48 x 120 feet, adjoining their plant on Smallman street, which will be used for the present as yard room, but upon which they contemplate building an addition to the works. The company reports an active business and is preparing to install a combined punch and shear to punch ⅞ inch through ¾ inch material and ¾ inch through ⅝ inch material; a 75 horse power gas engine for power and a 50 horse power gas engine for an electrical plant; a bevel and mitre cutting saw to cut at any angle, for all of which they are in the market. They are completing contracts on structural work for the Chartiers brewery, the Hill-top brewery and alterations at the Bijou theatre.

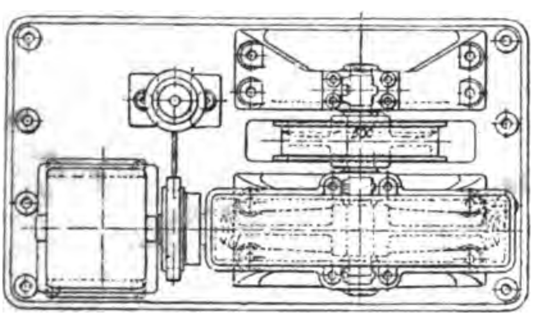
Tool Company's Removal—The Chicago Pneumatic Tool Company has been so long located in the Monadnock block that they have become pretty well identified with it, but owing to their requirements for greater office room, which they are unable to procure in that building, have decided to remove to the Fisher building, May 1. After May 1 the company will be located on the tenth floor of the Fisher building, Dearborn and Van Buren streets, Chicago, and will occupy very nearly the whole floor. The New York office will remain, as heretofore, at No. 95 Liberty street.

ELECTRIC LIFTS FOR FURNACE BELL-TOPS.

BY F. JANSSEN, "Stahl and Eisen."

THE prejudice which blast furnace engineers generally entertain against the use of electricity has hitherto impeded the application of this form of energy for operating the bell-top. Even at present the majority of new furnaces are furnished with bells worked by steam, hydraulic power, or compressed air. In justificaton of this prejudice against electrical machinery, blast furnace engineers point to some very unsatisfactory results obtained by its employment in the past. It is not to be denied that this particular application of electricity, as well as most others in large iron works, necessitates a departure from time-honored methods and the installatiion of special types of machinery. We must remember that this want of success is entirely attributable tothe ill-advised employment of faulty and unsuitable apparatus, and not electricity itself.





Electric Hoisting Winch for Blast Furnace Top.

It is our purpose to first describe, with the aid of illustrations, a blast furnace bell-top lift, made by the "Union" Electrical Company, of Berlin, who work in conjunction with the British Thomson-Houston Company, of Rugby. This lift has been in active operation for about a year. In converting the ordinary hand-power hoisting winch for the "Langen" bell-top into a machine driven by electric power, the design evolved was that of which a general view shown in Fig. 1. The rope attached to the longest arm of the bell lever is either directly, or through the medium of an intermediate pulley, carried to the drum, on the shaft of which a worm wheel is keyed. The engaging worm works in a bath of oil and is located in the lower part of a casing closed on all sides. It is likewise rigidly coupled to a reversible motor, from which it receives its motion. The manipulation of the lift at the mouth can be effected from any desired spot, by moving the switch. When the switch handle is in the horizontal position, as in the drawing, the motor is out of

circuit. and consequently the lift stops. If the bell is required to be raised, then the switch handle is pushed upwards about 30 degrees; if it is to be lowered, then it is moved in the reverse direction. This arrangement, which is extremely simple, renders any mistake impossible for the operator always pushes the switch handle in the direction he wants the bell to go.

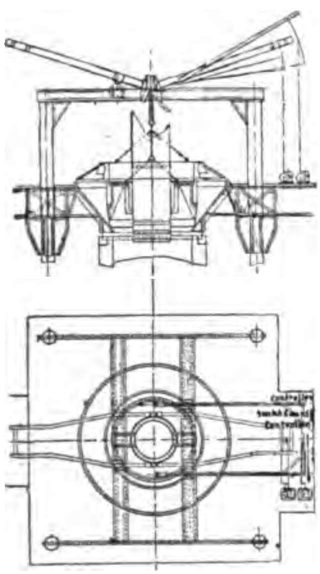
The device for preventing the bell from being lifted too high is of great importance for the safe working of the apparatus. This can be effected by not attaching the rope firmly to the drum but simply coiling it, while the free end is weighted with a counterpoise. The unbalanced weight of the bell is to be overcome by the friction between the drum and the rope. An arrangement is introduced in virtue of which the counterpoise, when the bell has attained the highest position, rests upon a projection provided, and then the drum skids without friction under the coils of the rope. The same action occurs when the bell closes. The introduction of an automatic device of this character does not materially complicate the construction, while it is quite as effective as compressed air or hydraulic power devices. An electrical regulator for this same purpose, which disconnects the motor from the conductors, is described farther on. The electric portion of the plant was especially designed so as to be well adapted to the peculiar conditions prevailing. The motor is compact and easily accessible. It is completely enclosed by a cast steel casing, the upper part of which, by loosening a few screws, can be moved without difficulty. Access to the inside is attained by opening two round swing doors, which close a couple of portholes. The motor casing is perfectly dust-proof, and after working for a period of some months no appreciable amount of dust was discovered. As to the attendance, a visit every 10 or 12 days suffices, when the collectors are inspected and lubrication is applied. It is therefore less than that necessary with other systems, which require long piping, and which if the supervision is not carefully attended to, may lead to serious breakdowns. The same remarks apply to the controller, which is similar in construction to that used on street tramways. The resistances are placed in a separate box.

As figure 1 shows, the winch is furnished with a brake, which may either be of the strap or the block type. It is operated by a falling weight, which is lifted up by an electro-magnet placed above it as soon as the starting switch is moved in one or the other direction. When, however, the switch cuts off the current the weight is released.

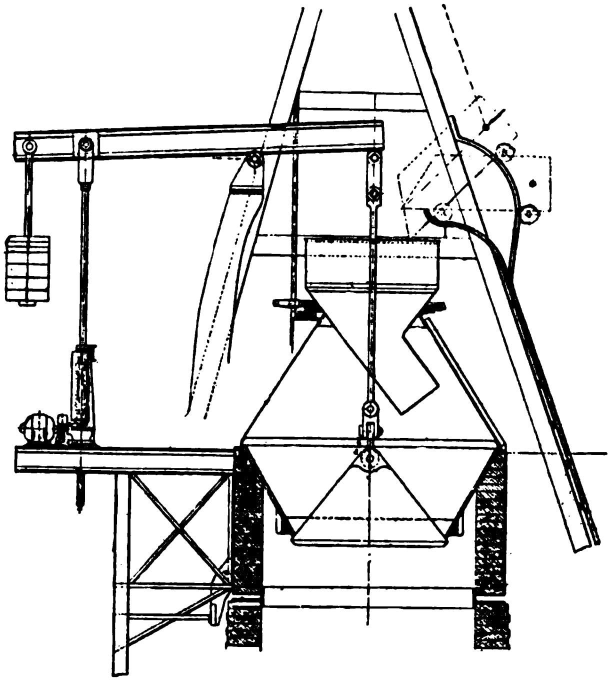
The arrangement shown in figure 2 may be adopted, in which the rope—located immediately above the casing—passes over and inside the same, to be connected to the screw-nut.

Figure 2 represents a double apparatus, driven by two independent motors, with separate controllers. This type of electric bell-top lift has also frequently come under the writer's notice and to his knowledge no breakdown has ever taken place. An automatic cut-off at the end of the travel can also—in a very simple manner—be operated by the sliding screw-nut, viz., by fixing to the latter a contact which, at the end position, switches off the current, whereupon the weight of the brake drops and the latter is thrown into action. The manipulation of the starting switch is the same as before. When pushed upwards the bell ascends. and when it has reached the limit of its travel the current is automatically switched off and the screw-nut remains stationary, without the intervention of the operator. No mistake is possible as to the direction, because the switch lever from the end positions can only be moved one way. This switch lever may be located either in the platform above or in the ground level. In the case of inclined elevators, charging the furnace automatically, it is desirable that the same man should have control over both the elevator and the bell-top lift. Under these circumstances the automatic circuit-breaker is found very useful, and it is usually employed in combination with an alarm indicator, which serves to advise the operator of the movements of the bell, and at the same time registers a record for the overseer. When these appliances are constructed of suitable materials they answer very well and do not get out of order. The absolutely reliability of electric registering apparatus has been long known and appreciated, so that

their introduction has become very general. With the lift the motor and controller are the same as described for the previous one. The only particular worthy of mention is that the front journal is given the form of a corrugated bearing. The screw-nut and spindle work in an oil bath. The entire apparatus is perfectly dust-proof. The winding power for the various elevators described varies between one and five tons, depending upon the non-counterbalanced weight of the bed. The speed depends upon the length the bed can travel; in most of the plants with which the author is acquainted this varies from 20 to 32 inches a second.



Double Bell with Two Electric Hoists.



Parry's Bell Top Worked by Electricity.

In order to make the escape of gas as small as possible in charging the blast furnace, it is necessary to reduce the time this operation occupies to the lowest limit. This especially holds good with furnaces furnished with only one cover, and in no case should the distance the bell is lifted be great enough to cause it to drop on its seat with violence. This is a point that is best determined experimentally in each particular case.

The lifts in use for Parry's cup and cone top for charging blast furnaces differ completely from the foregoing. The charger, as in the case of Langen's bell, is suspended from a two-armed lever, but is much stronger in construction in consequence of the very great weight on the cone during the operation of charging. The steam or compressed air hoisting appliances—in the Wrightsons system—consist of a working cylinder and a brake cylinder, and the connection is established direct by means of rods with the longest arm of the lever. The various parts of the machinery have to be made of extraordinary strength.

A general view of an electric lift for one of Parry's bells. is shown in figure 3. From these it will be seen that a jointed rod connects the lever of the bell with a crosshead or block, which is moved in a vertical slide by the up-and-down motion of a spindle. When the block occupies its lowest position the mouth of the furnace is closed, and vice versa. The electric motor, through the medium of a couple of bevel gears, operates a screw-nut which, together with the former, revolves in a reservoir of oil, carefully cased in. The motor, lubricating vessel and vertical guide are all mounted on one common bed-plate, on which rests also the electro-magnet brake

described, in this case having the form of a leather-lined block working on a disk coupling. A contact piece on the cross-head—on its reaching the end position—automatically swiches off the current as soon as the cone at the furnace has dropped into its place. As seen in the figure, there is a reserve hand mechanism, which also through the intermediary of bevel gears, can be made to operate the vertical spindle. The motors, as before, are of the enclosed type. The particular lift we have been considering was constructed for a charge of 20 tons and the travel of the spindle is equal to 44 inches. In all the preceding appliances the covers are suspended from double armed levers, which also serves to carry the balance weights. A simple arrangement—certainly as regards room—is when the hoist is located immediately above the mouth, without the interposition of the lever. This system is principally found in those furnaces in which the gas is drawn off at the periphery, and the bell or cone hangs on a chain or rack operated by machinery or by hand.

The introduction of electricity as the motive power presents no difficulty, but rather the reverse, for the small motor is very easily mounted. This class of machinery should in each case be specially designed to suit the particular circumstances but the designer ought to be thoroughly acquainted with the various types of bell-top lifts already in existence. It is therefore not possible to give any practical suggestions that are likely to be of service.

In conclusion, we must consider what are the advantages derived from the employment of electricty for working the bell-top lifts in blast furnaces. One of especial importance is the fact that the transmission of the motive power is exceedingly simple and very reliable; it is not influenced by the weather; it is economical and requires no supervision; and, lastly, it is only in active use when the lift is actually doing work. On the other hand, with steam, compressed air, or hydraulic power, the influence of the surrounding temperature is very considerable; there is pressure in the pipes at all times, whether working or not; and, notwithstanding the most careful attendance., the efficiency is low. From these causes the pipes cannot be altogether relied on. so that in many cases a reserve system is introduced requiring the same constant supervision as the principal one. These difficulties disappear when electricity is employed, for it is only necessary to connect the motor, put on a net work of conductors already existing for supplying the electrical lighting at the blast furnace mouth. Other advantages are—greater economy, and the possibility of introducing automatic machinery, rendering the attendance simpler and safer. This is especially of importance with blast furnaces fitted with two covers at the mouth, in which class it is desirable that the hoists should be extremely exact in their action. Lastly, it is advantageous that the switch can be located in any desired position.

As regards the kind of current which is best, we may state that both the continuous and alternating varieties may be used, as the motors described can be constructed for either. Hitherto the continuous current has generally been already at hand for the electric light, and on that account has been in most cases employed for the lifts. Even in large works, utilizing the alternating current for the motive machinery and the continuous current for lighting, the management have, to save complication, connected the bell-top lift up to the conductors of the latter. The results attained in the systems described lead to the conclusion that the use of electricity exclusively at the blast furnace mouth will become general, especially as the recent improvements in the gas-driven dynamo materially assists production.

Burning Pulverized Coal—The promises of economy gains from burning pulverized coal have for forty years led to persistently recurring experiments.and each new venture in the field has been heralded with claims of final success. After all, however, experience in every instance seems to have ultimately demonstrated that it is difficult to obtain combustion of such fuel with as small an amount of air per pound of fuel as can be obtained in the best pracitice with coal fired on an ordinary grate, and this has always tended to make the economy lower than with the usual method. Besides this, the power required to operate the coal pulverizer and feeder has counted against the efficiency of the plant as a whole, and there is generally some difficulty from the collection of ashes and unconsumed particles of coal in the back connections of the boilers. Judging from all available data, these drawbacks still remain to be overcome—From Cassier's for April.

NOTES FOR THE CHEMIST.

Determination of Sulphur in Iron—H. E. Walters and Robert Miller, (Proc. Eng. Soc. W. Pa. Chemical Section. Vol. XVIII, No. 2.) The authors call attention to the fact that the sulphur is not all evolved as H_2S by the usual treatment, and suggest the following method: Five grams sample are weighed in a porcelain boat and then placed in a thin porcelain or nickel tube, heated in a furnace. A current of natural gas or hydrogen is passed through the tube to prevent oxidation. Anneal at a bright red heat for 15 minutes. Allow to cool in an atmosphere of gas. Remove boat from tube, transfer contents to flask, and treat with dilute H Cl (1-1). Absorb evolved H_2S in cadmium chloride solution and titrate as usual. The authors give a table showing results by the above method; by precipitation as Ba SO_4, and by the evolution method without annealing. On American Foundrymen's Association Standards B & C the following results are reported: Usual method .038-.038-.040; as Ba SO_4-.056-.054-.057 and after annealing as above .056-.055.057 per cent. Usual method .059-.059-.060; As $BaSO_4$-.076-.074-.075 and as above .076-.075-.074 per cent. With shot or chilled samples of ordinary iron, the annealed sample give an increase of from .005 to .015 per cent sulphur. In the presence of titanium, the sample should be annealed at least 30 minutes. The following results are from a sample containing Ti. Usual method—.044-.043 weighed as Ba SO_4-.076; and by the authors method .076-.076 per cent.

Standardization of Potas. Permanganate—Herman Thiele and Hans Deckert(Ziet. Chem. 14, 1233) The authors have made a number of experiments from which they conclude it is better to use pure re-crystallized oxalic acid than the various kinds of pure iron recommended for that purpose.

Determination of Carbon in Steel by Direct Combustion—B. Blount. Analyst, 1902; 27,-1-5.(Abstract, Jour. Soc. Chem. Ind. Vol. XXI, No.4). Five grams of steel turnings, mixed with 15 to 20 grams of re-fused lead chromate, are placed in a porcelain boat within a deep tray of sheet Pt. and pushed into a porcelain tube. The Pt. is used to prevent the sticking of the boat to the tube by chromate which might creep over. The front part of the tube contains copper oxide which is heated, as well as the tube behind the boat, in a Fletcher furnace. The exact spot where the boat lies is heated (to as high a temperature as the porcelain tube will stand) with a blast lamp. The oxygen, purified by passing through a potash-bulb and soda-lime U-tube, enters the porcelain tube through a glass T-tube with flattened end, which allows the boat to be seen during combustion. The front end of combustion tube projects several inches beyond the furnace, in order to cool the gases, and is connected to the absorption train by means of a glass cap and rubber ring instead of a tube passing through a stopper. The absorption train consists of (1) an empty bulb-tube to cool gases; (2) a drying tube of sulphuric acid pumice; (3) the potash bulb and drying tube in which the CO_2 is weighed; (4) a second drying tube, which is weighed occasionally; and (5) a guard tube of sulphuric acid pumice to which the aspirator may be attached. With adequate temperature, no difficulty was experienced in burning the whole of the steel in about an hour The U-tubes and potash bulbs are of special design. With this improved apparatus the remaining defects of the method are due chiefly to the imperfectly refractory nature of the glaze on the porcelain tube, which becomes slightly sticky at the temperature employed.

Tungsten in Steel—Rudolf Fieber (Abstract from Chem. Zeit. in Jour. Chem. Soc. Mar.1902) A modification of method by Fresenius. Five grams sample are dissolved in H Cl. After boiling and diluting, insoluble matter is collected and fused with potas. and soda carbonates, dissolved in HCl, and added to main solution. Evaporate to dryness and heat to 120 degrees C. Cool, dissolve in HCl, boil for three hours, dilute and filter. Boil filtrate for three hours to recover last traces of tungstic acid. The precipitate carries down traces of iron and chromium and all the silicic acid. The washed precipitate is ignited, fused as above, and re-dissolved in water. Neutralize with nitric acid, boil to expel CO_2., exactly neutralize, and precipitate tungstic acid with mercurous nitrate. The mercurous tungstate on ignition yields tungstic acid, which can be freed from any silica by treatment with hydrofluoric acid.

AN Oil Saver—The injudcious use of ordinary oil cans, as well as some special forms of which the "squirt-gun" type is quite common for a variety of applications, provide no uncertain opportunities for great wastefulness of lubricating oils. The device herewith illustrated in two different forms for economically applying oil to working parts, is reputed to have had its origin in an operating department of pronounced wastefulness, and originally provided for the oiling of mine car wheels, but its accredited benefits duly adapted it to the operating departments of the various classes of mining and other machinery and general manufacturing institutions wherever lubricants are required. A saving of as great as 50 per cent in labor and oil is said to have followed its adoption in some of the large coal mining properties. Not unlike other innovations, the earlier productions are indicated to have proven deficient in construction.

The appended illustrations of the Ironsides Improved Tormay Patent Oiler the product of all past experience and from which former inherent weaknesses have been eliminated and suggested improvements from the more experienced users incorporated, is describd as an article of superior design, workmanship and great durability The oiler consists of a central working barrel, containing a plunger and surrounded by an oil reservoir. Openings in the working barrel, sealed or unsealed, according to position of plunger. communicate with the oil reservoir. The adjustability of the stroke of plunger governs quantity of oil forced each operation. When not in use its contents are not only preserved from leakage, but also protected from dust and other impurities. The Ironsides Company, Columbus, Ohio, manufacture this oiler.

The Cash Basis in Engineering—All other things being equal—adaptability, soundness, efficiency—the engineering work which costs the least money is the best. I do not know of any other product of man's creative powers of which the same can be so truly said. The "cash" basis is the real foundation upon which the engineer builds, and this consideration draws us at once from judging engineering as merely something cleverly done by an ingenious person. It also very often serves to distinguish between college. text-book or rule-of-thumb engineering and the real thing.

At any rate it places in due prominence a quality which those who regard engineering studies from the college standpoint are apt to ignore. I have heard a legend of a professor of applied mechanics who was shocked at the thought of steam engines being made to sell for money like cakes. A good deal of wasted ingenuity would be save if those who engage in every kind of engineering work would remember to use the money standard, as well as the foot-rule and the higher mathematics.

Real engineering must be mastered as it is realized on works in progress. It has no authoritative text-book. The working engineer's library is sometimes largely composed of ephemeral manufacturers' catalogues and lists of prices current of materials. Like the perfect artists described by Longfellow, the engineer must learn to work with the means that lie readiest to his hand. He must cherish his ideals or he will sink into the routineer, but he, of all men, cannot afford to indulge in hobby riding. He leaves as little as possible to chance, and, if he is wise, he will not rely upon his best mathematics any further than he can see them. If he starts with aptitude, plods on with patience, observes with insight, records with careful exactitude and adapts with wisdom, in the fullness of time he will find himself. almost to his surprise, in possession of judgement, and that is the glory of an engineer, fitting him for his highest employ as man of all work to civilization—James Mansergh in Cassier's Magazine.

AUTOMOBILES.

BY HIRAM PERCY MAXIM.

IT is a singular fact that even among engineers the automobile is not generally well understood. Probably the least well understood feature connected with the automobile is its field, or just where its place among modern apparatus really lies. The public generally think of an automobile as a kind of toy intended more for recreation and sport than anything serious. In the minds of a very considerable number of people an automobile is looked upon as a fad, comparing with the roller skate and the bicycle.

It cannot be denied that there is an automobile fad to-day. The indications point to its ranking any previous fad in history, which may make it a matter of considerable commercial imporance. But this is not the whole story. To tell the whole story and to show the automobile's real place in the world there is perhaps no better way than to recite the results of those examinations and tests which have been made as a guide in the application of the automobile to certain existing transportation troubles. This data has not before been collected, to the knowledge of the writer, and, in addition to explaining the real place of the automobile, it may also act as more or less of a mile-stone in these early days of its development. It is as follows:

Urban or city transportation, or at least that part of it which is today having trouble with its motive power is divided into four classes:

First—The transportation, in a private vehicle, over irregular routes, of usually one, but possibly two passengers, engaged in such service as the daily visiting of physicians, contractors, inspectors, and similar business men.

Second—The transportaion of one or more passengers over irregular routes in a hired vehicle driven by a hired driver, or as is better known, cab service.

Third—The transportation of several passsengers of regular omnibus lines on city streets which are prohibited to street cars.

Fourth—The collection, transportation and distribution of miscellaneous, city and suburban merchandise.

Taking up the divisions of city transportation as they have been given, their general characteristics which show the cause of the trouble are as follows:

Private vehicles for one or two passengers—From mileage tests and examinations of business carriage service in several large cities it has been found the total mileages made per day run between 15 and 20 miles. The average horse is said to be able to go not over 15 miles every day in city service, if he is to last any reasonable length of time. In regular service it is seen that 85 per cent of the carriages go more than 15 miles in a day. By horse motive power it is then plain that either rapid depreciation must be suffered or the motive power equipment duplicated. Either case produces expenses which are the beginning of the unsatisfactory performance.

This question, however, in practice is not the only one that is troublesome. In every-day work the horse as a motive power needs consideration which is inconvenient. He is not easily cut out, so his power cannot be accidently turned on. He requires protection from cold and heat. He cannot, without injury, accept an overload for an interval and then stand under no load for a longer interval. He has ailments which cannot be investigated with a two-foot rule and cured by renewal of the affected part, and he is limited in speed on long runs where speed is safely possible and most economical.

To substitute a mechanical motive power in this service a few more of its characteristics are required. Especially is this important in the determination of the most suitable of different forms of motive power.

It is found that only 12 per cent of of all vehicles in daily use run more than 20 miles before returning home. Likewise, only 18 per cent run 18 miles or more before returning. In other words, no less than 82 per cent run less than 18 miles before opportunity for some form of re-charging occurs.

The length of time at home before starting again which would be admissible for re-charging was then investigated, as it of course would be the important factor,

taken in consideration with the mileages, in determining the kind of motive power most suitable.

It was found that 85 per cent of the vehicles laid over at the home point a total of 2¼ hours or more during every day's work. The remaining 15 per cent either laid over an hour or not at all, probably due to eating the noon day meal at home and immediately going out and remaining out all the rest of the day, or picking up the meal at unknown points.

Investigation was also made into energy expenditure per ton mile or "wattage," as I have termed the value, These measurements were made by mounting a record watt hour meter in an electric automobile, and either following around the vehicles, being observed from the start in the morning until the finish at night, or by putting the automobile directly into the actual service itself. Mileage and stop readings were of course also taken. It was found that in fairly level cities, such as New York, Hartford, Chicago, Cleveland and Philadelphia, the service wattage bore a relation to the wattage on a level asphalt road, called "Level Wattage," of from 1.10 to 1, to 1.13 to 1, or in other words, an increase of from 10 per cent to 13 per cent. In Pittsburg the figure was found to be from 20 per cent to 25 per cent, due to the hills and bad pavements.

With all this data, it becomes easy to determine the motive power most suitable for the majority of the work. If in only 12 per cent of the cases the total mileage per day exceeds 30 miles, and in only 18 per cent of the cases the maximum mileage before return to home point is 18 miles, and in 85 per cent of the cases, the total time of lay-over at the home point is 2¼ hours or over, and the service is one where the business man, preoccupied and hurried, does the driving, then it is undoubtedly safe to say that for 75 per cent of this service, electric motive power is best, and will ultimately be used. For the remaining 25 per cent with its short or entire absence of lay-overs, or where the mileages are beyond the practical field of the electrical equipment, the engine propelled system is best and necessary. For the entire 100 per cent of the service we furthermore see that the automobile, even as it exists today, is able to better do the work than is the horse.

Private vehicles for one or more passengers—This is, of course, the cab. The cab is really an enlarged type of the small private vehicle just discussed, but furnished with a hired driver. It is distinctly a business vehicle, and though public nominally, is really private while in the employ of the passenger.

The service of the cab is found upon investigation to be very peculiar. Its characteristics are not susceptible of plotting as in the case of the small business carriages. It seems to have a high caste and a low caste. In its high caste form it demands, regardess of cost, the maximum of comfort and convenience in the transporation of a passenger, from the very door of his starting point to the very door of his destination. In its low caste form, it demands the lowest possible rate of fare, and only a moderate degree of comfort.

In the high caste form the horse is fairly satisfactory, though his expense due to depreciation reduces the possible earnings. This is the principal form in which cab service exists today.

In the low caste form there are but very few cabs in existence. What there are —the Boston herdic being a good example—are entirely unsatisfactory in comfort, speed, distance capacity and cleanliness, owing to the very rigid economies necessary where the horse is the motive power.

The mileages of both classes of cabs have been found to be large in the aggregate per day, as may readily be imagined, since mileage is nominaly earnings. The lay-overs are frequent and at times long, but they are usually irregular. The wattage, or energy expenditure, has been found to be very considerably higher per ton mile than ordinarily would be expected. This is due to the presence of the hired driver, and the less careful manipulation the vehicle receives at his hands than it does at the hands of the owner. The cab driver is always interested in hurrying, in order to earn possible reward in the form of fees, and has, up to the present time, no direct interest in keeping down wear and tear and energy expenditure. The owner of a vehicle, the driver usually in business carriages, on the other hand, is financially interested in both.

In practice it is found that the service wattage averages an increase of approximately 30 to 35 per cent over the level wattage. When it comes to motive power, the high caste service is interested only in the electric, and that only as a means of getting greater mileage per day, better speed in trips and consequently more trips in a day, and lower operating expenses. In New York over 200 automobile cabs are in daily service in this high caste work. All of of them are electrically propelled. They have unquestionably provided at least some of the improvements demanded, for we find them a recognized factor in the city's transportation problems. The strength and permanence of their position may be judged, when it is stated that they are used for daily transportation because of their ability to give a maximum of privacy and comfort, and to consume less time than would be the case by an other transportation available.

When we come to the local price cab, where the governing law is the survival of the cheapest, the conditions are different. The horse has been unable to make possible a cheap cab, which is satisfactory. As things stand, we usually have nothing that is publicly available between a one dollar, or more often a two, three, or even four dollar carriage, and a five cent place on a a street car. Every night in the year, in most of our large cities, this unsatisfactory graduation in the scale of transportation facilities is a cause of extreme discomfort, and oftentimes suffering. As an example, take a rainy night in Pittsburg. Hundreds, and more frequently thousands, of people returning from places of amusement are compelled to crowd into a street car filled already to overflowing with steaming, wet humanity, and be pushed and elbowed in the closest contact with we know not whom, for half an hour, and finally deposited, in probably 75 per cent of the cases, a quarter of a mile from their homes.

A finer graduation of the scale than is represented by five cents and $2 would be very acceptable to a great many of these people, but the horse cannot supply this finer graduation and make it pay. The substitution of a mechanical motive power changes this state of affairs, however.

As an indication of what is possible in cost per ton mile with the prime mover propelled vehicle the following is of interest: In the ordinary gasoline engine propelled automobile of today, the level ton mile is easily accomplished on .066 gallon of gasoline. If the service wattage is 25 per cent over level, the service gasoline consumption per ton mile would be .083 gallons. If the daily milage is 40 and gasoline costs 13 cents per gallon, and the cab and load weigh 2,000 pounds, the cost of fuel for the entire day's work would amount to

$$.083 \times 40 \times .13 = \$\ .43.$$

The only additional vehicle expenses would be lubrication and depreciation. These could be enormous and out of all probability, and yet leave the cost far below what would be possible with the horse.

With an electric system the power being originally generated by a prime mover, the many conversions of it makes it usually cost more per ton mile than is the case when the prime mover is directly upon the vehicle.

On this basis it would seem that the engine propelled automobile would be able to best withstand the workings of the law of the survival of the cheapest.

With such a motive power driving an automobile cab, several steps become possible of insertion in the graduation between 5 cents and $2.00. I firmly believe such an automobile is not only possible today but inevitable in its coming. It will make available to us a means of transportation which in comfort, convenience, speed and rate of fare will cause 75 per cent of us to adopt for all evening, and a certain share of our day traveling.

Sawdust Fuel Briquettes—Sawdust in cake form appears to have been used as fuel in Germany with rather promising results. United States Consul A. L. Frankenhal, writing a short time ago from Berne, Switzerland. says that the sawdust cakes are octagon-shaped, 6½ inches long, 3½ inches wide and three-quarters of an inch thick, weighing about half a pound each. In the district surrounding the factory where these cakes were made the schools were heated by them. the combustion leaving very litle ash and proceeding without a large flame. No binding ingredient is said

to be used, the sawdust being simply dried and pressed into the desired briquette shape, and owing thus to the absence of tarry or oily substances there is no smoke in burning. The weight of such a briquette indicates the heavy pressure under which it takes its shape, and the edges look like polished oak; in fact, it is heavier than a piece of hardwood of the same size. The demand created by the popularity of the fuel exceeded the supply of sawdust obtainable in the vicinity of the factory, and shiploads were, therefore, procured from Sweden and carloads from distant manufactories. Sawdust, which previously could be had for the asking, demanded a market price as soon as it became known that a certain factory could make use of it. Even then it was profitable to manufacture the briquettes; but unfortunately, the factory was destroyed by fire and operations came to a standstill. Making sawdust briquettes of this kind would, therefore, seem to be worth inquiring into further.—Cassier's Magazine for April.

The Southern Coal Field.

THE Southern Appalachian coal field has greatly increased its production in the last twenty years from less than 1,000,000 tons in 1880 to not far from 12,500,000 tons in 1900.

This field, according to Dr. C. W. Hayes, in the third part of the Twenty-second Annual Report of the United States Geological Survey now in press, has its Northern boundary just North of the Southern row of counties in Kentucky, and includes portions of Kentucky Tennessee, Georgia and Alabama. It practically coincides with the Cumberland Plateau and its outliners Walden Ridge, Sand Mountain, Lookout Mountain, Blount Mountain, etc., its Eastern boundary facing for the most part upon the Appalachian valley, and its Western boundary being like its Southern margin, extremely irregular. From a breadth of about 50 miles at the Kentucky-Tennessee line, the field tapers to its narrowest point, less than 30 miles, opposite Chattanooga, and then broadens Southward to 85 miles in Northern-Central Albama. The three main districts of this field are the Jellico, the Chattanooga, and the Birmingham, each named from its most important town.

The Jellico district, including the Jellico, the Wartburg or Brushy Mountain, and the Middlesboro basins, extends from the Emory river Northward a short distance beyond the Kentucky line. The Chattanooga district, including the Sewanee, the Walden and the Lookout basins, extends from the Emory river Southward a short distance beyond the Georgia and Alabama lines.

The Birmingham district, including the Warrior, the Blount Mountain, the Cahaba, and the Coosa basins, extends from a line connecting the Southern point of Lookout Mountain and the great bend of the Tennesse river Southwest to the Southern limit of the coal field. Dr. Hayes does not think it probable that any important extension of the coal field as now known need be expected.

The Jellico district includes Knox, Bell, and Whitley counties in Kentucky; Scott, Campbell, Anderson, and Morgan counties in Tennessee. This district contains some 15 beds of coal which are now worked and which average between 3 and 4 feet in thickness. The chief development is in the Eastern part of the district. The Chattanooga district, divided longitudinally by the Sequatchie valley includes Roane, Rhea, Hamilton, Marion, Putnam, White and Grundy counties in Tennessee; Dade and Walker counties in Georgia; and Jackson county, Alabama. Thirteen beds of coal, averaging about three feet in thickness, are worked in this district. The lower group of coals have not been found sufficiently thick and regular, except in the vicinity of South Pittsburg and at Bon Air for profitable working. The Birmingham district, lying wholly in Alabama, includes Etowah, St. Clar, Shelby, Bibb, Tuscaloosa, Jefferson, Blount, Cullman, Walker, Winston, and Marion counties. In this district 39 beds averaging about 3.5 feet in thickness are now worked. In 1899 one bed alone, the Pratt, yielded 65 per cent, about 4,000,000, tons of the total yield of the Birmingham basin.

The coal of the Southern Appalachian field is all bituminous, and a large propor-

tion of it produces coke but little, if any, inferior to the Connellsville standard. Excellent coking coal is found in all three of the districts of the field, and in the Warrior basin practically all the beds yield coking coal. In most cases where coke plants are connected with the mines the coal is screened over 1¼ inch bars, and the lump coals sold for domestic and steam fuel, the screenings being coked direct or after washing. Coal was discovered in this field by the early settlers and was used by local blacksmiths. In 1836 some coal was mined in Alabama in the Coosa basin and sent down the Coosa river, and a small amount was also mined in Tuscalcosa county and sent to Southern Alabama by the Warrior river. In 1840 some coal was mined at Rockwood, Roane county, Tennessee, and hauled to barges on the Tennessee river. With the building of railroads from about 1854 the real development of this coal field begins, and with the building of the Roane Iron Company's furnaces at Rockwood, Tennessee, in 1867, and with the rebuilding of the Oxmoor furnace near Birmingham, Alabama, in 1870, and the demonstration of the use of this coal for coking, the great development begin. Omitting the three Kentucky counties, the product of this field in 1880 was over 973,000 tons, valued at about $1,338,000; in 1890 it was about 6,488,000 tons, valued at over $6,800,000: in 1900 it as over 12,418,000 tons, valued at over $14,300,000, Of this product 27 per cent was used for railroad fuel, 36 per cent for manufacturing fuel, 14 per cent for domestic fuel and 23 per cent in making coke. In the Jellico district of Tennessee, the mines are fairly well organized, and in past years strikes have been somewhat frequent. A fruitful source of irritation was the presence of leased convicts in some of the mines. This has been removed by the opening of state milnes at Brushy Mountain, where convicts are so employed as not to come in direct competition with free labor. In the Birmingham district the miners are paid at most of the mines on a sliding scale, depending on the selling price of iron. The miners are well organized, but strikes have hitherto been infrequent. Both white and colored labor is employed in these mines, apparently without friction.

A lage proportion, about 75 per cent, of the operators reported favorable prospects for increased producion in the immediate future. Twenty-seven counties in the three states having 175 commercial mines, produced over 12,418,000 short tons in 1900, while the estimated capacity of these mines was something over 16,573,000 tons. The markets supplied by the coal from this field are chiefly to the Southeast, South, and Southwest. From the Jellico district coal goes chiefly through Knoxville toward the Southeast into Eastern Tennessee, Western North and South Carolina, and Northern Georgia. Probably 50 per cent of the Chattanooga distict coal is converted into coke and used at the local furnaces; a part of it goes into Central and Western Tennessee, and still more into Northern Georgia and South Carolina. The Birmingham district practically controls the markets of Southern and Western Georgia and the whole of Alabama and Mississippi, except along the Mississippi river. Between Atlanta, Ga., and Columbia, S. C., it competes with coal from East Tennessee, Virginia and Kentucky. Along the Atantic coast and in Florida it competes with the water-transported coal from the Northern Appalachian field; and, in like manner, along the Gulf coast from Pensacola Westward, as well as in the territory immediately adjoining the Mississippi, it competes with Ohio, Pennsylvania, and West Virginia coal brought down the river in barges. The Birmingham district has recently, largely through the Southern Railroad, become a strong competitor for this Mississippi river and New Orleans trade. The principal demand for fuel in this region is for the sugar mills. The Louisville & Nashville, the Cincinnati Southern, the Tennessee Central, the Nashville, Chattanooga & St. Louis, the Southern, the Central, of Georgia, the Alabama Great Southern, the Kansas City, Memphis, and Birmingham railroads supply the Southern Appalachian coal field fairly well with transportation facillities.

ZINC SMELTING METHOD.

SAMUEL DAVIES, of Iola, Kansas, has just obtained a patent on a novel method in the process of smelting zinc. The invention consists in placing a mixture of zinc oxid and particles or pieces of non-refractory substances within a retort or the like, externally heating the latter, passing hydrocarbon gas through the charge, thereby effecting the reduction, the gas combining with the oxygen of the ore and settling free the metal, conducting the gas through a condenser to cause a deposition of the metallic zinc, and then allowing the gas to escape.

In carrying out the process, the ore, which is zinc oxid, is prepared in the usual manner by pulverizing. The ore particles are admixed with particles of non-combustible non-metallic refractory material, as pieces of old retorts, fire-clay, and the like, reduce to about the size of pea, the whole thoroughly commingled. The prepared ore is placed in a retort in the furnace, the retort being adapted to be highly heated from its exterior closed to the outer air, and in communication at its outer end with a receiver or condenser, of the usual form, the exterior surfaces of which are cooled by contact with the outer air.

In charging the inner end of the retort is covered with the ore to a suitable depth. A pipe of refractory non-metallic substance is placed in the retort on the ore and the retort completely charged, the pipe being buried in the ore. The inner end of the pipe is open, and the outer end down-turned and communicates with a gas pipe for conducting hydrocarbon gas to the pipe, which has suitable cocks to control the passage of the gas. In placing the condenser on the outer end of the retort to close it the down-turned outer end of the pipe is passed throuh an opening in the lower side of the condenser. The joint between the condenser and the retort is then cemented, and the opening in the condenser through which the down-turned end of the pipe passes is also cemented, preventing leakage, the cement securing the pipes together. The retort must be thoroughly cleaned out at the completion of the smelting of each charge. Hence a fireclay pipe is adapted to be quickly removed from the retort with the condenser. The mouth of the condenser is partially closed with some porous substance, such as screened residues or ashes from former charges, to prevent the escape of any metallic zinc that may accumulate in excess before being drawn from the condenser; but the mouth of the condenser must never be so closed as to prevent gases or vapors from escaping.

The retort is highly heated exteriorly, and when the temperature reaches the requisite degree the hydrocarbon gas is introduced into and through the body of the ore in the retort. Owing to the relatively refractory particles which are commingled with the ore particles the gas penetrates the entire body of the charge, the gas combining with the oxygen of the ore, settng free and carrying the vaporized metal, the metallic vapor passing into the receiver condensing as metallic zinc in a liquid state, which when poured into a mold is ready as spelter, the remaining gases escaping through the open mouth of the condenser into the air.

By the Davies process the cost of the production of zinc is lessened, especially in natural gas regions.

Tin Plate Merger—Arrangements, it is stated, have been completed for the amalgamation under the title of Baldwin's Limited, of five British firms connected with the production of sheet iron and steel. The firms in question are: (1) Messrs. E. P. and W. Baldwin, Limited, who have sheet and tin-plate works at Wilden, near Stourport, at Swindon, near Dudley, the Stour Vale Sheet Mills, Kidderminster, and the Cookley mills, Brierley Hill the two latter recenty acquired from Knight and Crowther, limited; (2) Wright, Butler and Company, limited, Elba Steel Works, Gowerton; Landore blast furnaces and steel works, near Swansea: Cwm Avon Iron and Steel works, near Swansea, and Monges Iron Ore Mines, in Spain and Portugal, and the Aberden Colliery, Port Talbot; (3) the Bryan Navigation Colliery, near Port Talbot; (4) Alfred Baldwin & Company, limited, Panteg and Pontypool Steel Works & Sheet and Galvanizing Works; and (5) the Blackwall Galvanized Iron Company, limited, Blackwall.

Use of Large Coal Wagons—At the half-yearly meeting of the London & North-western Railway Company, February 21, the chairman, Lord Stalbridge, said: "You have all noticed the great excitment there has been regarding the great American idea that big wagons are the right thing. Well, in the first place, a rapid change from our small and present type of wagon to a large wagon, even if it were possible, would be exceedingly costly. We must go by degrees, and we must feel our way gradually, for it is not only the railway companies, but it is the collieries and coalpits themselves, the various hoists and tips all over the country, that must be considered. You may remember what Sir James Thomson said at the meeting of the Caledonian Railway last year—that if they built bigger wagons there was not a coal tip in the country at which they could be loaded; and so we have to be very careful, and we must all move together if it is found necessary to move in that direction. Now, we have built lately at Crewe two trains of thirty wagons each, each wagon to carry 20 ons. They are built of steel and they will, I hope, last some years very well. Now, those wagons will be used for a specific purpose. They will make the journey from Crewe to the collieries where they are loaded. If you multiply twenty by thirty, which is the number of wagons, you get 600 tons. You can therefore get 600 tons from the pit at a time. You can bring it to Crewe or anywhere else you want to deal with it. It is not like a trader who wants a few wagons up into one depot, and a few into another. We have large masses of coal—a stable product going a certain distance, and being able to be dealt with rapidly and promptly at each end where it arrives or leaves. That is perfectly different from the conditions under which the coal traffic, as represented by the traders in this country, is carried on. I speak, of course, more particularly with respect to household coal coming into large towns. There is a certain traffic of coal going from the pits to iron industries, and so on; smelting works where there is a certain steady flow of coal backwards and forwards and there these large wagons of a certain size can be used with advantage; but we shall watch with great interest the result of the working of those wagons that we have built for locomotive coal, and when we can we shall probably extend the practice. In the goods department they have had large wagons built, but I am told that they have had great difficulty in finding places where they can be used. I do not mean to say that we are pledged to 10-ton wagons for all time, but looking at the number of wagons we have — yes, and you must remember, not only wagons owned by the railway companies of this country, but a far greater number that are owned by private traders all over the country—before any material alteration can be made in the size of wagons, it is a question that has to be looked to from many sides. I will not give you the exact weight of these wagons, because that is not actually settled, and because there is a question of the best brake to apply to them, which will make a difference in the weight; but the saving of weight in the length of a train will be 420 feet, and we should save length in the siding accommodation. You would also have your whole train more manageable and under command. These wagons are built pretty much on the same scale as the present 10-ton wagons, so that they suit the present screens and weigh bridges at the collieries, and so far as they have been tried they have given very good results."

The City Fuel Oil Pipe System—Delivering fuel oil to houses and factories just as gas and water are delivered now, through pipe systems, is one of the schemes which is said to have been prompted by the latest oil discoveries in the United States. According to report, a purchase offer has been made for one of the city waterworks with the view of closing it for water purposes and reopening it for the oil business. The present reservoir, which will hold about 2,000,000 gallons, is to be converted into an oil tank, and the mains are to be used for carrying the oil at minimum cost to consumers. It would only be necessary to turn on the water-cock to get as much oil as a consumer needed, and a meter would keep account of the amount supplied, thus affording, it is thought, the most perfect system of fuel oil distribution in the world. The oil would be pumped from one of the oil fields to the reservoir, and from this, by natural pressure, without further pumping, it would be distributed to all the points of consumption in the city With the reported money interests backing the project, this would seem to be entitled to rather more than passing conisderation—Cassier's Magazine.

AMERICAN MANUFACTURER AND IRON WORLD.

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EDITORIAL COMMENT.

The Miners' Course.—The semi-official announcement that the coal miners of the anthracite region have determined to begin a strike, is the first event of that character to disturb the quietness of the industrial situation. The idleness of the anthracite miners will not have the same wide-spread effect upon the general industrial situation that a strike among the miners of the bituminous fields would, but will be a disaster in itself, temporarily. When the national convention of the United Mine Workers so suddenly and unexpectedly throttled the wishes of perhaps a majority of the districts in the bituminous fields in their endeavors to have the convention declare cause for a strike especially in Pennsylvania, Ohio and Indiana, the outlook seemed to take on brighter hue. The word had gone out with apparent official ring, though not announced by any officer of the miner's organization, that a strike of the coal miners was in preparation, but when the later announcement came that the national officers of the miners' organization had suppressed the advocates of a strike it was taken in good faith.

Within ten days after the decision of the Indianapolis convention the information made its way through the country that a miners' strike was to be called early in the year. Somewhat slowly came the supplementary statement that the strike was to be made by the miners of the anthracite fields. When that was established the reason why the eagerness of the bituminous miners to have a strike of their own was killed off by the national convention was plain. It would be out of the question to have two strikes of such proportions at one time or within one year so the bituminous miners must wait for another season.

The miners of the anthracite territory have not been exploited in strikes in many years so that the field seems to offer some advantages to the strike leaders not presented by the bituminous fields. And as the former strike of the anthracite miners was comparatively short with some of the "merits" of a technical victory it is not difficult to understand why the national officers of the United Mine Workers preferred to have a strike in the anthracite regions instead of the bituminous fields. Should the pitcher be broken there then the bituminous districts are always ready for a strike.

When the miners of the anthracite regions have had some of the experiences of the bituminous miners in the most recent years they may be less willing to follow the policies of that class of trades union officers who believe that the best way to get more is to take less. If the mass of the miners could see results as clearly as their leaders, there would be fewer strikes and less suffering among the families of the miners. Until the time of clear vision comes the trades union officer whose sole remedy for all ills is to stop work, will retain his pose as a friend of labor. But not after that time.

The Alloy Cycles—Readers of the technical papers have no difficulty in tracing the course of the inventors so far as they are connected with the manufacture of certain alloys. Perhaps none have been so much discussed or so severely discounted as the copper hardening method. The inventor of the only genuine commercial method of hardening copper with and without alloys stands at the head of the list of inventors, numerically speaking. The present seems to be a particularly favorable period for bringing out the copper hardening processes. Several patents have been issued recently all possessing the merit of "newness" essential to cover a later method. In this age of rapid development and inventions it would be risking too much to say that anything mechanical is impossible. It may happen that some day the man may be found who will reach the point of success in the copper hardening process but in the temper of the world the inventor will have his greatest difficulty in rounding it into a commercial possibility. There have been so many sure commercial methods that the man who finally reaches the goal, in whatever future century, may have cause to wish that the honor had fallen upon other shoulders than his own. In the meantime "new" processes without number will receive the authorization of the patent office and at certain intervals the epidemic will bring into print some accounts of the methods.

A Mention of Men.

John Welsh, a consulting engineer of Manchester, England, with his son, Frank, is in Pittsburg, to make a contract with Riter & Conley for the construction of a number of mechanical stokers which are to be placed in Milwaukee. They will be made from Mr. Welsh's patents and will cost about $75,000.

R. Blum and G. Bloch recently graduated from Central School of Engineers, of Paris, France, were in Pittsburg during the week, accompanied by D. Lery, who is interested in French railways. In speaking of their visit Mr. Blum said "Our visit to the states is simply one of pleasure. We are visiting points of interest and are much pleased with what we have so far seen. In regard to the French school of engineering to be erected in America I think Chicago will be selected as the location, for the reason that mill owners there have thrown open their mills for students who want to study direct."

It is generally understood, and the report is not denied or confirmed by him, that E. O. Hopkins, president of the Sloss-Sheffield Steel & Iron Company the past two years, succeeding Sol Haas, has resigned, and will retire from the company May 1. It has been rumored for months that Mr. Hopkins, who is a railroad man, has intended resigning to return to New York to re-enter the field abandoned when he came to the Sloss-Sheffield company. He is to be succeeded by J. C. Mabin, of New York, chairman of the board of directors.

John Molamphy, the oldest employe of the Carnegie Steel Company in point of service, retired April 1. Mr. Molamphy was superintendent of transportation and labor at the Homestead plant. John Lawler, his assistant, assumes charge of transportation, and A. W. Cline, assistant superintendent at the Carrie furnaces, becomes head of the labor department.

A party of 23 students of the engineering department of Cornell university in charge of Prof. H. Wade Hibbert, made a visit of inspection to the different plants in New York and Pennsylvania, this week. The party visited the Eliza furnace, pressed steel car works, Pittsburg locomotive works, Jones & Laughlins, and the Westinghouse plant.

J. J. Gray, manager of the properties of the Sloss-Sheffield Steel & Iron Company at Sheffield and Florence, will leave the services of the company May 1. He and associates have purchased the iron furnace at Rockdale, Tenn,. and will operate it.

W. P. Gentry Hillman, in charge of the Sloss-Sheffield City furnaces, has resigned, effective May 1. He will go to Pittsburg, where he will study Northern methods of iron making and furnace management for several months.

A. L. Bobbs, of Pittsburg, who has been in the employ of the American Bridge Company, left for Pueblo, Col., a few days ago to accept a position with the Colorado Fuel & Iron Company.

T. C. Culverhouse, manager of the coal properties of the Sloss-Sheffield Steel & Iron Company will leave the services of the companyMay 1.

W. W., and E. C. Lucius have removed from the Iron Exchange building to the new House building, at Smithfield and Water streets.

Barry Jones has been appointed auditor-in-chief of the Bethlehem Steel Company, South Bethlehem, Pa.

Average Iron Ore Rate.

From the several iron ore concerns engaged in shipping ore from Duluth and other ports at the head of Lake Superior the Marine Review has received figures showing number of tons moved and average rate in 1901. From these reports the average rate on all ore moved from the head of the lakes last year (13,663,481 gross tons) is found to be 79.9907 cents. It is probably surprising that the average rate is a small fraction below the contract rate of 80 cents, but the explanation is found in a large amount of ore that was moved on long-time contracts at rates considerably below 80 cents, as against a small amount of "wild" ore moved late in the season at rates up to $1.25 The following table shows the average rate (tonnage average) for nine years past:

Average rate cents, 1901, 79.99; 1900, 120.7; 1899, 79.4; 1898. 59.4 ; 1897, 63.8; 1896, 97.7; 1895, 85.9; 1894. 78.9; 1893, 94.1.

The newly-incorporated Pittsburg Piston Packing Company, was organized Monday by electing Charles E. Dickson president, treasurer and general manager, and W. H. Sponsler secretary. The company will at once open headquarters on Fourth avenue. The new concern will act as the selling agency for a patent metallic piston packing for engines invented by W. S. Jarboe, of this city.

NEW DILWORTH MINE.

The Dilworth Coal Company's is the first independent mine to be opened up in the Fifth pool of the Monongahela river since the Monongahela River Consolidated Coal & Coke Company was formed to take over and operate the river mines. It is situated about a half mile below Lock No. 6 at Rice's Landing and the company owns about 700 acres of coal and nearly half a mile of river front. The officers of the company are, H. P. Dilworth, president; George M. Dilworth, secretary; and C. B. Mc Lean, treasurer. The directors, are F. E. Richardson, of the Pittsburg Forge & Iron Company; J. Marshall Lockhart, of the Lockhart Iron & Steel Company, and N. A. Hemphill, of McIntosh & Hemphill.

The Dilworth Company's Coal Plant.

The mine is a shaft 175 feet in depth and the thickness of coal is seven and one-half feet and of good quality. The size of the main shaft is 20x12 out to out of the lining timbers, and the air shaft 18x12 out to out. The work of sinking the shafts was started August 16 and completed November 2, 1901. The work was prosecuted night and day using compressed air drills, on both shafts simultaneously, at the rate of nearly 18 feet a week.

The illustration appended shows a general view of the plant. The engine and boiler house is built of white sandstone with red brick trimmings, making a very substantial building. The stone was taken from the shafts.

The hoisting engines are a pair of 22x36 inch direct acting link-reversing hoisting engines, with conical drums seven to nine feet in diameter, built by the Vulcan Iron Works, of Wilkes-Barre, Pa. The boiler plant consists of four 18 feet x 72 inch horizontal tubular boilers built by R. Monroe & Son, of Pittsburg, and the steam piping by the Pittsburg Gage & Supply Company.

The tipple is arranged that loaded cars run from the cage by gravity to the tipple dump, which is a Phillips automatic cross over dump. After the cars are dumped they go by gravity to a switch-back, and thence to the foot of an incline operated by a chain haulage plan. This chain haul carries the empty cars up to the top of the incline, where they are automatically released and run by gravity to a switch-back in the rear of the shaft, which in turn, returns them to the rear of the car ready to be pushed on to the car and at the same time pushes the loaded car off the cage. From the time the loaded cars leave the cage till they are returned to the cage empty, the entire operation is automatic, except at the dumping at the tippl

and only two men are employed in handling the cars, one at the tipple dump, and the other at the shaft; thus, keeping the cost of handling cars on the tipple to a minimum.

The mine is ventilated by a Capell double inlet fan 15 feet in diameter, seven feet wide, direct connected to a Chambersburg high speed engine with 19 x 16 inch cylinder, and is guaranteed to produce 250,000 cubic feet of air against a water gauge pressure of 3½ inches.

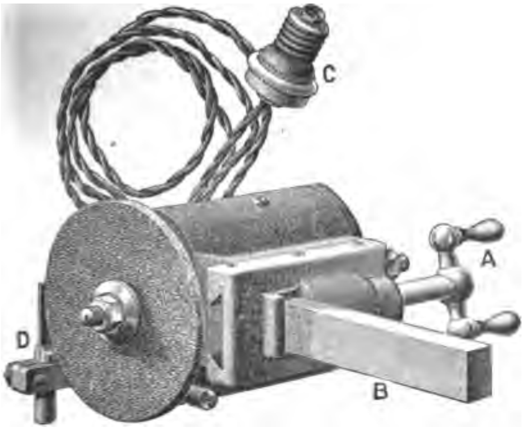
The plant is one of the most modern and up-to-date plants on the Monongahela river, being built and equipped so as to produce and load coal into the boats at the least possible cost. The plant was designed by, and built under the superintendence of William Glyde Wilkins, civil and mining engineer, Westinghouse building, this city.

Two steamers' and a large number of coal boats have been purchased for the transportation of the coal, which will be taken by several of the large manufacturing plants in Pittsburg, assuring a market for practicaly the entire output of the mine.

The Hisey Grinding Machine.

The illustration shows the "Hisey" electrical driven grinding machine for use in machine shops and foundries, especially for center grinding, reamer and cutter ginding, surface, parallel and internal grinding. It can be attached to any tool post and put to work in a minute.

The grinders are wound for 110 and 220 volts, direct current, and have all the parts pertaining to the motor encased in the shell, making it



dust proof. The spindle carries taper cone bushings running in 3 degrees and 45 degrees bearings, which are provided with dust proof caps. They are adjustable to wear by means of a nut on the rear end of spindle. The V slide has a two inch travel through the handle (A) and is fitted with gib to take up the wear. The shank (B) is of steel and is fitted to slot in V cap. It is held in position with a screw and different sized shanks can be used. The tooth rest (D) for cutter and reamer grinding, acts as an index to insure teeth being ground correctly. The current is carried to the motor through the drop cord (C). Connections are made from any regular incandescent light socket. The machine is made by the Hisey-Wolf Machine Company, Cincinnati, O.

Technical Bodies.

The regular meeting of the Foundrymen's Association of Philadelphia was held at the Manufacturers' Club last evening. C. Kirchhoff, editor of the Iron Age presented a paper on "The Trusts and Their Effect Upon the Business World."

A business meeting of the Engineer's Club of Philadelphia will be held Saturday, April 5, 8 p. m. John Birkinbine will read an illustrated paper on "Changes in the Manufacture of Pig Iron." To be followed at the next meeting by a paper on "Modern Developments in the Production of Open Hearth Steel." Illustrated. By James Christie.

The Boats Are Moving—The first boats of the Pittsburg Steamship Company fleet started from Cleveland Monday morning on their first up-the-lake trip. Hereafter boats will leave there daily until the entire fleet has been moved. The same program will be carried out all along the South shore, excepting at Buffalo, where the boats will be detained for the time being. No reports have been received from the Soo showing the condition of the lock, but the officers of the fleet expect to get the boats through by the time they reach that point. Sunday a special train load of sailors left Cleveland numbering 300 in all, to go to Duluth to take charge of the fleet of the United States Steel Corporation.

An increase of wages of 25 cents a ton has been granted the puddlers of the American Iron & Steel Manufacturing Company, Lebanon, Pa. The puddlers asked for an increase of 50 cents a ton. The men are now receiving $4 a ton but want $4.50, and it is said that they will refuse the 25 cent advance.

The Shenango steel mill of the United States Steel Corporation, at New Castle, Pa., started Monday morning, after an idleness of several weeks for the introduction of new machinery that increased the capacity from 1,000 to 1,600 tons daily.

IN AND ABOUT PITTSBURG.

J. R. Gilbertson general manager of the South Jersey Gas & Electric & Traction Company, Camden, N. J., was in Pittsburg last week investigating gas lines and gas industries in this district. The South Jersey Company will build two batteries, of 600 each, of by-product coke ovens the same type as those being operated by the United Coal & Coke Company, at Glassport, Pa., the chief product of which will be gas, for which purpose an order for 40 miles of 12 inch pipe has been placed with the Manufacturers' and Producers' Supply Company, of this city, at a cost not exceeding $352,000. The pipe will be manufactured by the South Chester Tube Company, South Chester, Pa.

Harry McCreary, has sold the Oklahoma coke plant, South of Graceton, Indiana county, to Joseph Wharton, of Philadelphia, who will utilize all the coke this plant can produce for his own iron works. Mr. Wharton now owns the Bourne plant in the Connellsville region. It is his intention to expend $100,000 at once in enlarging it. His plans include the building of 126 additional ovens, a washer, tenement houses, a store room, water works, etc., work on which will begin as soon as the weather permits. All of the machinery to be added will be of the latest design and improvements.

During the week the Carnegie Steel Company secured a contract for 15,000 tons of structural steel to go into a modern skyscraper in Chicago. The amount of steel involved is about the largest for any ordinary office building in the country. The Carnegie Company has the contract for the steel for the new Farmers' Deposit National bank building amounting to 10,000 tons, and has already completed a large amount of the material. Much of it is stored in the mill yards awaiting cars and motive power for shipment into the city proper.

Coal operators who have been busy loading cars for lake shipments from the Pittsburg district complain of the utter lack of motive power among the railroads to move the coal after it has once been consigned. The old trouble has not improved, they say, and while there are some indications that look favorable for a better condition of affairs in a few weeks, no credence is placed in such a favorable change and there is a general holding back of the shipment movement.

The Riter-Cooley Maufacturing Company, this city, has received the contract to erect for the Colorado Iron & Fuel Company, at Pueblo, Col., eight steel smoke stacks, each 10 feet in diameter and 200 feet high. The same Pittsburg concern is now engaged in erecting the various buildings of the same company. These buildings require 25,000 tons of steel, which has been shipped from Pittsburg. The erection of the plant is about half completed.

A special meeting of the Pittsburg Chamber of Commerce was held last Thursday to receive a report from the executive committee of the chamber on the advisability of extending an invitation to the American Manufacturers' Association to hold its next annual convention in Pitsburg, in 1903. The executive committee reported in favor of having three members of the chamber to go before the next meeting of the asssociation at Indianapolis, April 15, and urge the claims of Pittsburg.

The Redding Engineering Company, recently organized, 3123 Second avenue, this city, is having plans prepared for a second story for part of its plant to be used as a pattern shop. The company is engaged in the manufacture of steam specialties, including steam pumps which it will build up to 2,000,000 gallons capacity, and pipe cutting and threading machines. Further improvements are contemplated in the machine shop which will require additional machinery.

J. A. Guiler, of the Guiler Sand Company, Connellsville, Pa., has bought 24¾ acres of fine sand at Round Bottom on the Pittsburg, McKeesport & Youghiogheny Railroad, and four acres at Byer's Fording, below Layton. The sand is a very fine grade and will be shipped for foundry and building purposes. The tract is underlaid with fire clay and the company of which Mr. Guiler is the head will shortly install grinding machinery with which to grind the clay.

The Forter-Miller Engineering Company, this city, was awarded the contract for the construction of the McKeesport Tin Plate Company's plant to be built at Port Vue. The company has also begun work on the construction of a blast furnace plant at Sault Ste. Marie for the Lake Superior Power Company and reports progress in the construction of the plant of the St. Clair Steel Company, at Clairton

The Mesta Machine Company, this city, shipped a pair of 46x60-inch reversing engines and a 45-inch blooming mill last week to the new plant of the LaBelle Iron Works, Steubenville, O. The blooming mill and engines are the largest of that type which the company has ever built. The company also shipped a 44x60 inch Corliss engine to the Aermotor Company, Chicago.

William B. Scaife & Sons' Company's structural plant in Oakmont is being enlarged and new de-

partments added. The change of a large amount of the mechanical equipment has required the suspension of operations temporarily, but this will not be for long, as the firm is burdened with orders and is straining every nerve to fill them.

The A. W. Cadman Manufacturing Company has been compelled to erect a factory suitable to requirements, and will be located hereafter at 2814-16 Smallman street. The company has just secured the contract to equip the steamships, "North West, and "North Land." two of the largest steamers on the great lakes with Cadman's indestructible blow-off valves, and Cadman's indestructible gauge cocks. The company has also increased the brass foundry capacity.

Options for a site upon which will be built an electric refining plant for copper have been secured in Pittsburg by the Occidental Smelting Company, of Washington. Railroad facilities and proximity to the coal and coke fields are the chief inducements to the company to build here. As soon as suitable property is acquired the Occidental company will secure a charter under Pennsylvania laws. The plant, it is said, will cost between $800,000 and $1,000,000 Contracts for the equipment will be awarded at once.

The Link-Belt Engineering Company, of Nicetown, Philadelphia, has completed the installation of a 200-foot rod conveyor at the plant of the Union Steel Company, Donora. It contains some features which are entirely new in conveyors for this purpose. One of the principal features is an automatic device for oiling the rollers, in which it employs its patent absorbent rollers, which is a demonstrated success. The Pittsburg office of the company is in the Park building.

The annual meeting of the stockholders of the Pittsburg Feed Water Heater Company was held last week and the following officers for the ensuing year was elected: James Bonar, president; J. E. Schlieper, treasurer and general manager; and Joseph Cawley, secretary. The company reports a large business for the year just ending on both the open and closed types of heaters.

The Seelar Elevator Company will apply for a charter April 5. The incorporators are J. J. Seelar, D. D. Hainer, and L. F. Seelar. The company will succeed the Seelar Elevator Works, 434 Second avenue, this city, and is arranged to secure larger quarters, which will include a machine shop and foundry.

The Hunt Foundry & Machine Company, recently organized, Frick building this city, has started work on two one story buildings, 70x100 feet, at New Kensington. The buildings will be used as an extension to the company's machine shop. The company will build a foundry during the coming summer.

A petition in bankruptcy was filed Monday last against the Hussey Steel Company, of this city in the United States district court and a petition was filed by the company admitting its insolvency. The creditors are Clara E. Hussey, the Kensington Brick Company, and J. R. McCreery.

Efforts are being made at New Castle to adjust the financial difficulties of the Hartman Manufacturing Company of that city in order to permit the resumption of operations. The Union Trust Company, of Pittsburg, is receiver for the company and agents are in charge of the works

The Ada coke works at Cheat Haven were sold by Isaac W. Seamans to a company composed of W. Bliss, J. D. Boyd, Charles E. Doyle, McCland Leonard, F. C. Vandusen, and J. E. Dawson for $50,000. The plant embraces 60 acres of coking coal and 18 ovens and tipples.

The Duquesne Fireproofing Company will apply for a charter April 10. The incorporators are F. W. McKee, George H. Albertson, E. J. Frauenheim, J. A. Frauenheim, and A. J. Duff, of this city. The company will manufacture fireproofing.

The Ingersoll-Sergeant Drill Company, of New York city, manufacturers of air compressors, rock drills, coal cutters, etc., has established an office at 1212 Park building, this city, in charge of Conrad Bollinger, Jr., who was formerly connected with the Cleveland office of the company.

An application for a charter will be made April 14 by the American Foundry & Construction Company of this city. The incorporators are Frank C. Kohne, Mount Murray, Charles S. Miller, Jerimah Miller, and Oliver Percival. The company has not as yet secured a site but will locate in the Pittsburg district.

The Pittsburg Construction Company, Bissell block, has secured the contract to erect the new steel buildings for the General Fireproofing Company, Youngstown, O. This work will consist of two buildings covering an area approximately 130x320, one of the buildings to be two stories high.

The offices of the Stilwell-Bierce & Smith-Vaile Company, Smith block, have been removed from room 422 to room 409, same building, where better quarters have been secured. E. M. Wagner, has connected himself with the Pittsburg office of the company.

The Schoen-Schwab car wheel plant is to be established at Butler in the near future. A corps of engineers for the concern have begun the preliminary surveys for the buildings, plans for which are said to have been prepared.

Owing to labor troubles at the works of the Morgan Engineering Company, Alliance, the

proposed extensive improvement of the plant, which was to have cost $350,000 and for which plans had been prepared, have been postponed.

The Monongahela Foundry & Forge Company, Pittsburg, was incorporated March 27 with the following directors: William S. Thomas, Edmund W. Arthur, Harrry H. Patterson, of Pittsburg.

An application for a charter was made April 1 by the McAuley Automatic Trap Company, of this city. The incorporators are R. G. McAuley, Samuel McCrum and A. F. Corey. The company is placing on the market an automatic steam trap.

The Washington plant of the Tyler Tube & Pipe Company will be materially extended the coming summer. The announcement is made by Colonel W. P. Tyler of New York, president of the company.

An application for a charter will be made April 4 by the Western Coal & Coke Company, this city. The incorporators are P. Keil, J. T. Keil, and Roy Wise.

The James H. Baker Manufacturing Company, of Tarentum, will double the capacity of its plant by an addition 325x80 feet, one story, of brick, costing about $100,000.

NOTES OF THE INDUSTRIES.

A meeting of the stockholders of the newly organized Reeves Engine Company, Trenton, N. J., was held a few days ago when officers were chosen and other matters preliminary to the beginning of actual operations by the concern received attention. Clifton Reeves was elected president; William M. Muschert, vice president; A. C. Reeves, treasurer; William A. Buckman, secretary. The Reeves company took possession of the plant April 1 and will very materially increase its capacity by the erection of new buildings, and the installation of additional machinery. An office and sales department will be established at once in New York city and later it is said the concern may fit up branch offices in other large cities.

The Crucible Steel Company, of America has sold its Burgess plant, at Portsmouth, O., to the Whitaker Iron Company, the Laughlin Nail Company, of Wheeling, and the Maryland Sheet & Steel Company, all independent sheet steel concerns. The Portsmouth plant has been abandoned, and was to be dismantled by the crucible concern. Now, however according to reports, the plant is to be rebuilt and parts of it are to be in operation by May 1. Two openhearth furnaces are to be built. The plant contains nine gas annealing furnaces, one pair furnace, six trains of rolls and a number of openhearth furnaces.

The last heat on the oldest rolling mill in the United States West of the Allegheny mountains, known as No. 1 mill of the Brown-Bonnell plant of the Republic Iron & Steel Company, at Youngstown, O., was turned out a few days since. The mill was erected in the 40's, and it has been a landmark among the industrial plants of that city. It will be dismantled, and on the site will be begun the construction at once of a fine finishing mill.

The new plant of the Wellman-Seaver-Morgan Engineering Company, Cleveland, O., which has been building for some months is nearly completed, and the management of the works will be under direct charge of Thomas R. Morgan, whose title has been changed to secretary and works manager. The other officers of the company remain the same, namely, S. T. Wellman, president; J. W. Seaver, vice president; C. H. Wellman, general manager; T. R. Morgan, secretary and works manager; and D. A. Hatfield treasurer.

The Davis-Walker-Cooper Company, Youngstown, O., has awarded contracts for a portion of its foundry and machine shop equipment. The machine shop will be 40 x 100 feet and the foundry 60 x 150 feet. The Whiting Foundry Equipment Company, Harvey, Ill., will furnish a 10 and a 15-ton converter. The Reade Machinery Company, Cleveland, O., will install a 16-foot planer and other tools.

At a meeting of the executive committee of the Continental Iron Company, operating the Wheatland rolling mill, it was decided to make improvements costing $200,000. Four heating furnaces will be installed, a universal mill and several finishing mills built. Among the creditors of the company who attended the meeting were James M. Bailey, president of the Fourth National bank, and D. L Wilson, president of the Fort Pitt National Bank, both of Pittsburg.

An increase of 10 per cent has been made by the Thomas Iron Company in the wages of the men employed at the company's furnaces, at Hellertown, Pa. After April 1, laborers will re-

ceive $1.20 per day, the highest rate paid the men in many years. The 10 per cent increase includes also the men employed in the mines which furnish ore for the furnaces.

The strike of the foundry department men of the Pennsylvania Engineering Works, New Castle, Pa., has been disposed of through the employment of new men. The strikers demanded a raise of from $2 to $2.25 daily, with the employment of additional men to lighten their work.

The Atlas Engine Works, Indianapolis, Ind., has increased its capital stock, and will correspondingly increase the capacity of its plant. The stock of the company has consisted of $350,000 of preferred stock and $200,000 of common stock. This has been increased to $1,000,000 of common and a like amount of preferred.

The Wheatland mill of the Continental Iron Company, Sharon, Pa., is to be improved to the amount of $200,000. This was decided upon at a metting of the executive board of the creditors composed of James Bailey, Pittsburg; H. B. Shields and Mason E. Evans, Youngstown, and W. D. McKeefry, Leetonia, O. Four large heating furnaces will be installed, a universal plate mill will be erected and several finishing mills constructed.

W. Copeland Furber, Philadelphia, will shortly send out plans for a large manufacturing establishment to be built at Wilmington Del., for private parties. The plans provide for a three story brick building, 50x190 feet; a one story brick building, 100x50 feet; and a one story brick boiler house 23x50 feet.

The Vulcanus Forging Company, Cleveland, O., has plans for an addition to its plant 140x125 feet. The company recently increased its capital stock by $50,000 which will be expended in making improvements. Which will be completed in 90 days, giving an increased capacity of over 10 per cent.

The Buckeye Engine Company, Salem, O., has extended the option of sale of the plant in Salem to a syndicate of Cleveland and New York capitalists for 60 days from April 1. The syndicate organized for the purchase of the plant and is incorporated under New Jersey laws with $1,000,000 stock.

The Gray & Blaisdell Air Compressor Company, Bradford, Pa., has under contemplation the enlarging of its machine shop to double its present size. The company is meeting with marked success with sales of its compressors.

A new apartment house is to be built at Atlanta, Ga., will be built by J. F. Leavy in the near future. There will be 350 tons of structural material required together with fire proofing, terra cotta, elevators, etc.

The Bush Engine Company has been incorporated in New Jersey, with an authorized capital stock of $5,000,000. The incorporators are Edward T. Magoffin, Frank Searles and Alfred G. Brown. The temporary address of the company is 525 East Main street, East Orange, N. J.

The Southwark Foundry & Machine Company, Philadelphia is supplying two 54x66 inch and one 36x48 inch Porter-Allen engines for the addition which the Dominion Iron & Steel Company has under way at the Cape Breton plant.

The employes of the Reading Iron Company, Reading, Pa., have asked for an increase of 50 cents a ton for puddling and a proportionate advance for finishers and others in every department. The puddlers have been receiving $4 per ton for months.

The Interstate Foundry Company will build a large new foundry at the corner of Sheridan and Tod streets, Cleveland, O. The new foundry will be 148 feet wide and 300 feet long. It will be constructed of steel, brick and wood, and will cost $35,000.

The Niles Sheet Metal Lath Company has been organized at Niles, O., with a capital stock of $200,000. The incorporators are Wade A. Taylor, C. S. Thomas, William T. Holzbach, F. W. Stillwagon and John F. O'Dea.

The building at 251 Bogan street, Cincinnati, O., has been leased by the Chambers Machine Company, recently organized. The company will build small hydraulic presses and a patented mixing machine.

The Morrellville Coal & Coke Company, Johnstown, Pa., has been organized by Messrs. J. C. Duncan, George W. Griffith and John Irwin. Application for a charter was made March 29.

The plant of the Ridgway Manufacturing Company, at Ridgway, Pa., was partially destroyed by fire a few days ago. The pattern shop and some of the other buildings were damaged. The loss will reach $10,000.

The strike of union iron moulders, inaugurated at York, Pa., in May, 1901, has been declared off, the strikers surrendering, and the men returned to work in every foundry but one.

P. S. Balkwill, Cleveland, O., will build a new brick factory building to cost $8,000 at Nos. 1289 and 1291 St. Clair street. The building will be 53 x 84 feet.

The cold roll and pickling departments of the Sharon tin plate mill are idle as the result of a strike among the openers who demand an advance in wages of 30 per cent.

The Pennsylvania Railroad Company will erect a large wheel foundry at Altoona, Pa.,

WEST VIRGINIA NEWS.

The Fairmont Coal Company began shipments to the lakes April 1. The output of the company is 23,000 tons daily. with the lake business it will average 32,000. The company has given a mortgage for $6,000,000 on its property to the Guaranty Trust Company, of New York. It is a supplemental deed reducing the interest charges of the company from 6 to 5 per centum.

George L. Hibbs and wife of Fayette, Pa., have transferred to William A. Longnecker and eighty others of Greene and Fayette counties, Pennsylvania. and Monongalia county, this state, 9,760 acres of Pittsburg coal in the Clarksburg district for $292,800. The purchasers constitute the new Short Line Fuel Company.

C. C. Moore, general manager of the Jackson Iron & Tin Plate Company, at Clarksburg, announces that the works will be completed and in operation in five weeks. The plant is the latest addition to West Virginia's manufacturing enterprises.

The Fairmont Safety Check Hook Company has been organized to move the Smithport, Pa., plant to Fairmont. A. B. McDonald, is presiden; J. A. Clark, vice president; C. D. Jenkins, secretary-treasurer; and D. E. Roy, manager.

B. F. Bailey, of Grafton, receiver of the Flemington Coal & Coke Company, is preparing to sell that property. A New York syndicate has placed an offer of $500,000 in the receiver's hands.

Cairo, W. Va., is preparing to build a water works system.

THE BIRMINGHAM DISTRICT.

The Republic Iron & Steel Company will, in a few days, blow in the new blast furnace at Thomas, the most modern plant in the South with a capacity of 225 tons of pig iron per day. The company has also let the contract for 160 additional coke ovens at Thomas. The company has 700 coke ovens in active service at Thomas. With the additional ovens the daily coke output at Thomas will be in the neighborhood of 1,250 tons of coke per day.

M. H. Smith, president of the Louisville and & Nashville Railroad Company, has interested himself in the proposition of John D. Dwyer, former superintendent of the Birmingham rolling mill, for the erection of a $500,000 rolling mill in the Birmingham district, which will roll larger steel sizes than heretofore turned out in Alabama. N. E. Barker, president of the First National Bank, Birmingham, is financiering the project.

The Southern Railway is building a branch road to the Flat Top mines of the Sloss-Sheffield Steel & Iron Company in Walker county. When this road is completed, which will be by July, the 600 state convicts of the Sloss-Sheffield Company kept at Coalburg, near Birmingham, will be removed to Flat Top. On the line of this new road the Globe Coal Company will also open mines. All through the coal field of Alabama the development is rapid and extensive.

Walter Moore, general manager of the Ivy Coal & Coke Company, has been appointed receiver of the Black Diamond Coal & Coke Company, which operates coal mines at Clements, Ala. The receiver was appointed on petition of the Maddox-Rucker Banking Company, of Atlanta. creditors of the company.

The Republic Iron & Steel Company, is building a new town at Houston, in Bibb county, where it is working a virgin vein of brown ore. Assistant district manager J. H. Adams, and auditor C. P. Rickev have laid out the town and have let contracts for the building of houses, etc

THE CINCINNATI DISTRICT.

The advance in the price of iron and steel bars on April 1 will benefit the Republic Iron & Steel Company, which produces a very large tonnage of this class of material. Officers of the company say that they expect the second half of the company's fiscal year will show results equal to or in excess of those of the first half, when the company earned $221,507, or a little less than 1 per cent on the common stock after $486,426 had been appropriated from earnings to the improvement fund. In the statement for the six months ending December 1, 1901, however, no charges were made for depreciation. December 1 the company had a profit and loss surplus of $1,331,173.

The Hoefinghoff & Laue Foundry Company closed a deal for the property in Norwood for which it has been negotiating for the past year. The plot includes nine acres of ground in the manufacturing disrict of that suburb. The company outgrew its plant at the corner of Front and Lawrence streets, and a year ago erected a branch at Norwood 200 feet front by 102 feet deep. The structure was so built that when it was desired to make an addition to it, the end of the building could be removed, and the addition could be made. It is the intention of the firm to erect an additional 400 feet to the new plant and give employment to 250 more hands, thus making 700 hands in both branches. The new structure will be a model of its kind of building for the casting of heavy machinery West of the Alleghenies, with a pay roll of nearly $10,000 a week.

The Lorain Steel Company, of Lorain, O., filed suit in the Common Pleas Court a few days ago against the Southern Car & Foundry Company, in which $5,668.16 damages is asked against the latter because of alleged defective car wheels. The Lorain company complains that it purchased 175 gondola cars from the defendants in 1899, and the latter warranted the wheels of the cars for five years. The Lorain company alleges the wheels on the cars are defective, and were condemned by examining experts of the large trunk lines in the country. The wheels had to be replaced with new ones before the Lorain company's cars were accepted by railroads, and this cost the above amount, for which judgment is asked against the defendant.

The arrangement that has been in operation between the Bullock Electric Manufacturing Company, of Cincinnati, and the Wagner Electric Company, of St. Louis for the sale of the output of the two concerns through the same general sales agency expires the first of April and a new arrangement will be entered into. On account of the fact that the Bullock company is by far the larger of the two concerns and has a great deal more business the Cincinnati company will take over the management of the entire selling agency with all of the various branches, and the output of the Wagner company will be handled by the agency under a special arrangement.

J. Fred Zeller, for 27 years connected with the Eureka foundry, and for twelve years its foreman, has decided to enter business for himself. Mr. Zeller leaves the Eureka company to establish the Sterling Foundry Company, which began operations in the plant of the Queen City Foundry, April 1, and which we will have the following officers: President, J. F. Zeller; vice president, J. George Zeller; secretary and treasurer, G. J. Henzelman, and Albert Weil, and Louis Lipp.

The National Metal Trades' Association will hold a meeting in this city April 8, at the St. Nicholas hotel, at which members from all parts of the country will be in attendance. J. H. Whiting, the head of the Whiting Foundry Equipment Company, Harvey, Ill., will be here to attend the meeting. Following the meeting there will be a banquet at the St. Nicholas in the evening.

The entire plant, equipment, raw material and finished stock on hand of the Cincinnati Safe & Lock Company, will be sold at auction Wednesday and Thursday April 9 and 10, at the site of the company's plant, 59 Elm street, and also 341 West Fourth street. There are 175 finished safes in the lot. The sale will probably be the largest sale of the kind ever made in the country.

Alabama's Coal Output—Following was the coke production of Alabama last year by counties: Bibb 467 ovens, output 862,450 tons; Jefferson, 5,211 ovens, 1,824,141 tons; St. Clair, 60 ovens: Talladea, 122 ovens, 3,876 tons; Tuskaloosa, 665 ovens, 137,000 tons; Walker, 401 ovens, 129,363 tons: total, 7,086 ovens, output 2,180,625 tons, an increase over last year of 60,708 tons.

The Cleveland Machine & Manufacturing Company, Cleveland, O., contemplates the erection of an addition to its plant.

The P. H. & F. M. Roos Company, Comersville, Ind., contemplates improvements to its foundry and machine shop.

The American Bridge Company, of Toledo, O., has the contract for the new car barns of the Lake Shore Railroad at Collinwood, Cleveland, O.

The McKibbin Gas Engine & Electric Manufacturing Company, Lima, O., has been organized with a capital stock of $100,000.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The markets of both iron and steel are moving along in a rut but it is a rut that is filled to excess with activity. The blast furnaces and steel plants are operating to the limit trying to catch up with old specifications so that further consideration of new business is almost out of the question. All that receives the courtesy of attention is an urgent request for the smallest possible quantities that may be snipped out of the heavy production. In general it may be said that the blast furnaces and all the steel finishing mills are operating more satisfactorily now than for almost a year. The supply of coal and coke is better than for months, enabling a more rapid production. The greatest obstacle that remains is that of transportation. While the iron and steel producers are turning out their material in larger and more regular quantities they are compelled to store much of it in available spaces about the works so that after all the improvement in the fuel and strictly productive ends of the markets the general market has experienced no relief whatever.

The only relief that has been extended came to the larger and regular consumers who have had to content themselves for several months with short supplies. The regular run of coke from the Connellsville region for the past month has benefitted the blast furnaces, and of course, whatever advanced the interest of the raw material producers came to the aid of the billet and finishing mills. The actual production has been increased probably five per cent all around within the month but that percentage over what was moving before that period, has not reached the consumers.

The finishing plants continue to refuse contracts except for delivery during the last days of the year while some refuse to designate time for shipment short of the first quarter of 1903. The merchant blast furnacs are not sold up for the entire year but are not anxious to contract for deliveries now at any price. During the week 6,000 tons of Bessemer were sold for prices ranging from $17 to $18 per ton at furnace. Some 2,500 tons of forge iron were sold at practically the same prices.

There is not the slightest ease in any department and cannot be for some months at the earliest. Contracts are waiting indefinitely until the mills are able to take them. There have been no withdrawals because of delays and there is an exceptionally heavy tonnage acutally waiting upon the convenience of the producers to be taken up when operations are less congested than at present. Such a state of affairs was never known before in the same manner. While quotations remain nominally unchanged, actual business is on a basis of from $2 to $5 per ton above official rates. Sheets and tin plates are being held down better than all other finished lines except, perhaps, bars.

CURRENT QUOTATIONS:

Basic	$17 25		Splice bars	1 50	
Bessemer		18 25	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	18 00		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	1 75
Fdy 2, Shn	16 90		Tank	1 60	1 7[illegible]
Fdy 3, Shn	16 15		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	15 60		No. 1 wrought	20 00	20 50
Bessemer billets	31 50		No. 1 cast	17 00	17 50
Open hearth	32 00		Iron rails	25 00	26 00
Steel bars	1 50		Car wheels	18 00	19 00
Iron bars, refined		1 90	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—A comparatively quiet condition of affairs has prevailed in the local pig iron market during the week now closing. The bulk of the business done has been of a more or less urgent, small order character, at prices largely dictated by the seller. The scarcity of iron for early shipment is as great as ever, and those that must have material pay the prices necessary to get it. For third quarter delivery conditions are steadier, and for the fourth quarter fairly normal. But the market is still charged with the possibilities of surprise, and almost anything may happen in it, except a decline in prices. As nearly as can be given, the following figures represent the Northern brands of iron in this and nearby districts: No. 1 foundry, $20 to $21 for shipment to July and $19 to $20 for the last half of the year; No. 2 foundry, $19.25 to $20 and $17.50 to $18; gray forge, $18 to $18.25 and $17.25 to $17.50.

Steel billets continue extremely scarce, no transactions being reported, and the price remaining nominally at $33 to $33.50.

Manufactured iron and steel products have not shown much change during the week, but a heavy tonnage is being placed right along, and premiums continue to be paid on all prompt deliveries. Bars are $2 a ton higher for carload lots and upward, with a good demand reported. Virtually no structural material of any size or shape is obtainable this side of midsummer. The sheet makers are unable to meet the requirements now being crowded upon them, and some trouble is brewing, probably including an ad-

vance in the card quotations. Plates continue to improve in demand, and deliveries are not as easy to secure as they were a short time ago. Prices are strong as quoted. but in many cases premiums are required for quick shipments.

The steel rail market developed no transactions during the week. Standard sections continue to be quoted at $28 at mill.

CURRENT QUOTATIONS:

Foundry, 1..........	$19 25	20 00	Girder rails.........	32 00	32 50
Foundry, 2..........	18 75	19 50	Angles, 3" & lr'gr		1 80
Gray Forge..........	17 50	18 00	Under 3-inch.......		1 90
Bessemer billets...		33 00	T's 3" and larger...		1 85
Open h'rth bil'ts...	35 00		Under 3-inch.....		1 90
Steel bars.............	1 70	1 80	Heavy plates.......		1 80
Refined iron bars..	1 90		Beams and chanls		1 85
Standard rails......	28 00				

Chicago—Up to the close of Monday the demand for bars continued most actively. There are probably few consumers in the West who have not closed for all or a large portion of their requirements for the season beginning next summer. For some time to come it would not be disappointing if there were to be a decided decrease in the inquiry for bars on long time conracts. But in the matter of deliveries there is no indication of a change from the serious shortage which for some time has prevailed in this market. In fact, the condition of the store trade is anything but improving in the matter of supplies. It is almost impossible to procure finished product in small quantities, and shipments from mill are not improving. Prices are strong in tone but without quotable change.

Pig iron in stock in the West is almost a negligible quantiy. There is hope for better supply in the starting up of the Thomas furnace, at Milwaukee, and in the probable change of a local furnace from Bessemer to foundry grades. Southern irons are arriving fairly well on old contracts, but none is for sale in large quantities. There are a few scattering lots which command a premium of about $2 per ton over nominal quotations.

It is reported that iron scrap rails have sold as high as $26. Scrap of all kinds is scarce and with a strenuous demand from melters and also an insistent inquiry from dealers, who have sold short, the tendency of prices is still upward. to the surprise of a considerable portion of the trade.

CURRENT QUOTATIONS:

Bessemer..............	19 50	20 00	Sheets, 26 store.....	3 25	3 30
Fdry Nohn 1.......	18 50	19 00	No. 27....................	3 35	3 40
Northern 2...........	18 00	18 50	No. 28....................	3 45	3 50
Northern 3...........	17 20	18 00	Angles..............	1 75	
Southern 1...........	18 15	18 65	Beams....................	1 75	
Southern 2...........	17 65	18 15	Tees......................	1 80	
Southern 3...........	17 15	17 ·5	Zees......................	1 75	
Forge.....................	16 65	17 15	Channels.............	1 75	
Charcoal...............	21 00	22 00	Steel melt'g scrap	17 50	18 00
Billets, Bessemer..	32 00	34 00	No. 1 r. r. wrought	20 00	21 00
Bars, iron..............	1 85	1 9·	No. 1 cast, net ton	14 50	15 00
Bars, steel............	1 75	1 80	Iron rails.............	25 00	26 00
Rails, standard.....	28 00		Car wheels..........	18 00	19 00
Rails, light..........	32 00	34 00	Cast borings.........	8 00	8 50
Plates, boiler........	1 90	2 ·0	Turnings.............	13 00	14 00
Tank.....................	1 75	1 80			

Cincinnati—A great demand continues in this market for Bessemer, basic malleable, and gray forge, and orders for round lots have been placed. On account of the scarcity higher prices have been paid, and the market closes very firm for the above varieties, with but limited offerings. There has also been a good demand for Northern and Southern foundry grades, and a satisfactory volume of business has been booked at from 50 cents to $1.00 per ton advance in some instances over quotations. An inquiry for 90,000 tons of Bessemer for delivery through 12 months is pending.

Southern furnaces have adhered to their basis of $12 per on for No. 2 foundry iron, and claim that they are selling right along upon that basis. Others assert that they are doing business upon a basis the minimum of which is $2 higher than the $12 basis. In the accompanying quotations the $12 basis, as held by Southern furnaces, is given for Southern iron for inside values, and the minimum views of others for the outside. In all other respects the market is featureless. Sellers are simply carrying out contracts made 60 days ago and guessing in regard to the course of the market for the balance of the year. There is a scattering demand for small lots of iron for quick shipment which cannot be supplied, and there is constant complaint regarding shipments on old orders. Notwithstanding improvement in transportation most blast furnaces have no stock of coke, and are uneasy in consequence of the threatened trouble with coal miners.

CURRENT QUOTATIONS:

South. fdy. 1.........	15 25	$16 75	Standard Sections	29 90	30 90
South fdy. 2.........	14 75	16 2·	Sheet, 26...............	3 40	
South. fdy. 3........	14 25	15 75	Sheets, 27.............	3 50	
South. fdy. 4.........	13 75	15 25	Sheets, 28.............	3 60	
Grey forge... ...	13 75	15 00	Angles, 3 to 6 in...	1 70	
Mottled................	13 50	15 00	Angles, 1¼ to 2 ..	1 82	
Shn. 1, soft..........	15 25	16 75	Beams and Chanls 15 in and under..	1 70	
Shn 2, soft...........	14 75	16 25	I b'ms 18, 20 24 in..	1 80	
L. Superior, fdy. 1	18 10	18 75	Tees	1 75	
L. Superior, 2......	17 60	18 25	Z's......	1 70	
L. Sup'r char'l c w	21 00	24 00	1 wrought scrap...	14 0	15 00
Haug'g r'k ccl, 1 ..	22 50	23 00	Steel mlting stock gross ton............	13 00	14 00
Sohn ccl w...	20 35	20 60	No. 1 cast.............	12 ·0	13 25
Jaksn cy. sil'y 1...	18 35	18 60	Old iron rails g t'n	18 50	19 50
St'l brs base hlf ex	1 72		Old car wheels....	15 25	16 00
Iron bars.............	1 82		Cast borings	6 50	7 00
Flange plates........	1 80		Turnings............	7 00	7 75
Tank steel...........	1 70				
Ordinary fire-box.	1 90				
Light rails...........	39 00				

Birmingham—The pressure brought to bear upon the Southern iron makers to force them to raise the price of pig iron has met with defeat, the producers declining to admit the idea although the brokers and the consumers alike seemed to prefer an advance in price if the makers would at the same time loosen the bridle

and accept orders for next year's delivery. The Southern manufacturers have thus absolutely stopped speculation and will continue to keep the Southern iron market in the most stable condition.

The sensation of the week was the report of the resignations of President E. O. Hopkins and other officials of the Sloss-Sheffield Steel & Iron Company. It is understood that Mr. Hopkins and J. C. Mabin, chairman of the board of directors. cannot agree on policy and management. The announcement with reference to Mr. Hopkins caused little surprise as it has been understood for months that he preferred returning North and re-entering the railroad business.

The furnaces and mines were greatly set back in their operations last week on account of the unprecedented rainfall. The Woodward Iron Company was compelled to close down its entire plant and many mines were rendered idle for several days. The rainfall was the heaviest on record for this period of the year. Shipments of metal have also been reduced by the rainfall, which absolutely paralyzed the railroads, compelling the annulment of schedules. It will be a week before normal conditions have been restored.

Progress is being made in a number of quarters for the establishment of new industrial plants.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn.....	$12 50	13 50	Tank	1 80	
No. 2 fdy, Sohn.....	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn.....	11 50	12 00	No. 1 wrought......	14 00	
Grey forge, Sohn..	11 00	11 50	No. 1 cast.............	12 00	
Billets..................	23 00		Iron rails.............	16 00	
Iron bars..............	1 70		Car wheels...........	15 00	
Steel bars.....	1 70		Cast borings.........	6 00	
Light rails............	38 00		Turnings	6 00	
Angles..................	1 75		No. 26 sheets.........	3 00	3 50
Boiler plates.........	1 90		No. 28 sheets.........	310	3 60
Fire box...............	2 00				

New York—Rogers, Brown & Company—With the opening of spring every phase of our iron market is watched with the keenest interest. Two years ago, at about this season, there was a sudden cessation of business and collapse of prices. It is not surprising, therefore, that cautious observers on both sides of the market should have misgivings about continuance of the great demand. Nor is it strange that makers should dread to see rapid price advances grow out of eagerness to get material.

It must be said, however, that up to this time those who have looked for overstocking, slacking of inquiry, re-selling of contracts, or other indications of an artificial market, have failed to find them. New business continues to come out in surprising volume. Architects and engineers see no evidence of postponing new work because of increase of cost of construction. As an electrical engineer put it: "If my clients undertake to wait until the big shops get slack of work and could make low figures, they might have to wait years."

Furnaces and mills deal with the inquiries as best they can. Pig iron is nearly taken up to the end of the year, and negotiations are commencing for the first half of 1903. As soon as crop prospects are reasonably assured it is believed that 1903 business will be placed in large quantity.

Prices of material are slowly advancing, but two influences tend to put a check on the upward movement. One is the general sentiment of makers in favor of steady prices. The wisdom of the policy of the U. S. Steel Corporation is conceded on all hands. The other influence is importations. German and English markets continue low. It is therefore possible to bring in all kinds of material at but slight advance on domestic figures. Engagements are being made almost daily for pig iron, spiegel, steel in various forms, and old material. It is believed that buyers representing several large consuming interests are quietly placing orders in Europe for tonnage of large magnitude.

CURRENT QUOTATIONS:

No. 1X fdy Sohn Jersey City.......	$19 50	
No. 2X fdy Jersey City..................	16 65	
No. 2 plain Jer. C	17 65	
Sohn. 1 fdy N. Y..	18 75	
No. 2 fdy N. Y.....	18 00	
No. 3 fdy N. Y......	16 50	
No. 1 soft......	15 75	
No. 2 soft.............	17 00	
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs....	2 30	2 40
Sheets, blue annealed, 10.........	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs.........	1 90	2 00
Plates ¼ and heav	3 15	
Ship & tank plate, on dock............	2 50	2 50
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10
Beams and chan'ls 15-in & under....	2 00	2 50
Angles...................	2 00	2 50
Tees.......	2 00	2 50
Zees.....................	2 00	2 50
Time deliveries, basis $1.75 for angles, beams and channels		
Com. base, bars per 100 lbs.........	1 65	1 70
Refined base, bars	1 85	1 90
Bands, base........	2 40	2 50
Norway bars.........	3 75	
Norway shapes....	4 25	
Old T rails, iron f. o. b. cars........	20 00	21 00
T rails steel f o b c	16 50	17 50
No. 1 wro't scrap iron f o b cars....	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes..	13 00	14 00
Old car wheels, f. o. b. cars..........	16 00	17 00
Old ham. car axl's f. o. b. cars.......	22 00	23 00
Wrought turnings deliv. at mill.......	11 50	12 00

Coal.

Pittsburg—The time for the announcement of the new prices on coal for the season is one of intense interest for the large consumers although with the renewed antagonisms between the two big coal shippers the probabilties of a heavy advance in costs to buyers is lessened. The new rate is expected to be in the hands of consumers not later than April 4 and may be sent out earlier. April 1 is the usual date and in general the impression is strong that the new schedule was ready and known to some extent at that time.

Cleveland—It is more than probable that be

fore the present week is at an end a large amount of soft coal to be moved to ports at the head of Lake Superior will have been covered by lake freight contracts at 35 cents a ton, the same rate that prevailed last year. Negotiations on the subject of coal freights have, in fact, progressed so far that the 35 cent rate is a certainty. Further progress has also been made towards a general settlement of labor questions notably an agreement between the firemen and several of the leading steamship companies.

Cincinnati—There is little change in trade conditions. Some anxiety was in evidence during the week on account of threatened strikes, but the outlook is for harmonious settlement. Coal has been dull and steady and so closes. Pittsburg afloat is held at 7 cents per bushel, and Kanawha at 6½ to 7 cents afloat. Prices to consumers are as follows per ton of 2,000 pounds delivered: Pittsburg, $3.00; Kanawha, $3.00; smokeless, $3.25 and anthracite, $7.00.

Chicago—From present indications it will require some time for the accumulated tonnage of Eastern coals to be absorbed by the market. There have been receipts so large, due to the delayed winter shipments that the local side tracks have been simply flooded with coal and holders are letting it go at any price, to the great demoralization of all fuels. But when this accumulation is out of the way, prospects seem to favor a much steadier market. Prices of all-rail coal for the East for the coming season have not been fixed. It is anticipated that the prices of lake coal will imitate the example of the anthracite market and, beginning with the lowest quotation of the season, gradually advance until the winter schedule is reached. The coal to be sent up the lakes this summer will be sold mainly on consignment, a radical departure from the method of last season. Prices of vessel coal at Lake Erie port have been fixed at an advance of five cents per ton for Pittsburg and Hocking Valley and seven cent per ton for Fairmont, W. Va.. over the prices of last year. Coke is arriving more freely.

Coke.

The operations in the Connellsville region for the week were not so satisfactory as hoped for by the producers. In general there were no serious delays but production and shipment did not come up to anticipations. Production was held up above the 220,000 mark, however, and that is something. The shipments to Pittsburg and river and Western consuming points dropped back but the movement of some to points East of Everson made substantial gains.

Notwithstanding the disappointment the coke operators were satisfied that the shipments were so heavy, exceeding production by almost 30,000 tons which will reduce the size of the stock piles at the different large plants. With the production running close 225,000 tons and shipments running above 250,000 tons per week the blast furnaces and foundries have less cause for complaint than for a long time.

A summary of the Connellsville region for the week shows 20,535 ovens in blast and 751 idle.

The following figures show the scope of operations.

Production for the week	221,165 tons,
" last week	221,461 tons.
Decrease	296 tons.
Shipments—	
To Pittsburg and river points........	3,458 cars.
To points West of Pittsburg........	5,779 cars.
To points East of Everson............	2,168 cars.
Total	11,405 cars.
Last week	11,344 cars.
Shipments in tons for week........	251,630 tons.
" " " last week........	250,998 tons.
Increase	642 tons.
Masontown Field	
Shipments for week	517 cars.
" last week................	664 cars.
Decrease......................	147 cars.
Shipments in tons...................	13,442 tons.
" last week................	17.264 tons.
Decrease	3,822 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3 50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.85 per lb., in small lots: lot of 100 pounds, $1.10 per lb.: special price on large lots

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight........................	$4 50
Bessemer Steel, 100 lbs...	4 40
Bessemer Steel, 95 lbs..	4 85
Bessemer Steel, 90 lbs..	4 30
American Charcoal Terne—I. C., 14x20 ordinary......	4 50
I. C., ordinary..	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight, 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs $4.75.

Ore Situation at Cleveland.

The 75 cent ore rate received confirmation at the close of the week in the announcement of various concerns that ore has been taken by vessel firms outside of Cleveland. The action is of more than ordinary importance, because of the possibility of future charters being based on it, even anticipating the business of the future for some years, a bold stroke considering the increasing relation between the vessel capacity and the material to be moved. Just what importance this will have in connection with the immediate markets is hard now to say. Vessel men are disposed to ignore the long term contracts as a feature in the market, and have acted with uncommon and remarkable unanimity in holding out for better rates, a faculty never before possessed by the Cleveland owners. It becomes apparent, however, that the fight now between the owners and the shippers is over a very small margin, unless there proves to be foundation for the statement that some of the eighty cent ore already covered has a seventy-five cent provisional clause in it. Up to date the situation stands: The steel corporation will remove 10,000,000 tons in its own boats, and has chartered outside capacity for the movement of 1,200,000 tons, all on the basis of seventy-five cents. The Republic Iron & Steel Company and others have taken 800,000 tons of ore on the seventy-five cent basis, and the smaller shippers, including Corrigan, McKinney & Company, the Cleveland Cliffs Iron Company, and Pickands, Mather & Company, have taken boats for the movement of about 4,000,000 tons on the basis of eighty cents. This, therefore, aggregates about 16,000,000, tons of ore already covered for the season. If the shippers are able to move 22,000,000 tons during the coming year, that will leave 6,000,000 tons, the movement of which is yet to be provided for. That being the case, there is not much of a margin yet to work upon in season contracts if anything is left to be brought down by the wild boats, and there is a disposition among most of the shippers to leave a good margin for such operations, as they have large faith in the open market this year.

BOOK NOTICES.

American Standard Specifications for Steel—by Albert Ladd Colby. This edition, the second, is a comprehensive presentation of the work done to establish an equitable and satisfactory uniformity in steel manufacture. Although these specifications were at first criticized and referred to by the technical press and by some engineers as "manufacturers' standards," they nevertheless grew in favor among consumers when it was found that just as good steel was furnished, as when using specifications containing many additional tests and requirements unnecessary in the present state of the art of making steel. The customer also soon appreciated that these standard specifications secured closer competition and more prompt deliveries.

Contradictory and obscure clauses have been eliminated, and tests of very doubtful value as a measure of the material when in service as well as those unnecessary in the present state of the art, were, as far as possible, omitted. The specifications were adopted as American standards representing the American practice of today. They are subject to change, and will be considered by the American Section of I. A. T. M. whenever requirements of service become more severe, better methods of testings are developed, or future improvements in manufacture render modifications necessary or advisable.

At the Congress of the International Association for Testing Materials held at Buda Pesth, in September, 1901, national standard specifications were submitted by the American, German, and French branches of Committee No. 1. A resolution recommended by the Council was passed by the Congress calling upon the Chairman of International Committee No 1 to report at the next Congress to be held in St. Petersburg, in 1903, on the expediency of adopting international specifications, and, if possible, to prepare a set of proposed international specifications for iron and steel.

The first edition of this review was presented by Albert Ladd Colby at the International Congress on Testing Materials of Construction, held in Paris in July, 1901. It included the text of the proposed standard specifications drafted by the committee in May, 1900. This second edition has been condensed and rewritten; the appendix contains the revised text of the American standard specifications as adopted by the American Section of the International Association for Testing Materials on August 10, 1901.

The Copper Handbook—1902 edition. Compiled and published by Horace J. Stevens, Houghton, Mich. Pages 416, octavo, with advertising section of 80 pages; $2 in buckram binding; $3 in full morocco. Ten chapters, on the history, chemistry; mineralogy and metallurgy of copper; a glossary of mining terms in common use; copper deposits of the world; copper deposits of the United States; leading foreign mines; Lake Superior copper mines, American copper mines, and statistics of the copper industry of the world.

This is the only work published that is devoted exclusively to copper, and the only work in any language covering the technology and statistics of the copper industry. Some 700 mines of

copper, including all mines of importance in the world, are listed and described, the length of the descriptions varying from few lines in the case of properties of little importance, to a dozen pages in case of the largest mines.

Coal Statistics—This book published by Alder & Ruley, 1215 Filbert street, Philadelphia, gives statistics of the production of coal and coke, by counties, for every state and territory. It contains complete directories, giving the name and address of every coal operator in the United States, and maps showing the coal areas in each coal producing state.

A convenient statistical manual and directory for railroad officers, mine operators, wholesale and retail coal dealers, manufacturers of machinery, dealers in mine supplies, and containing information of interest to everyone. Price 50 cents, postpaid. A copy will be mailed to any address, subject to approval, if requested.

The Metal Markets.

LONDON—Tin—£116-12s 6d—£16 7s 6d Sales, 270 tons spot; 440 tons futures.

Copper—£52 17s 6d-£52 Sales, 500 tons spot; 1,050 tons futures.

Lead—£11 7s 6d-£11 6s 3d.

Spelter—£17 10s.

NEW YORK—Tin—\$26.25—\$26.00.

Copper—Lake. 12¼; electrolytic, 12⅜; casting 12¼—12.

Lead—\$4.15.

Spelter—\$4.50-\$4.30.

ST. LOUIS—Lead—\$4.05-\$3.97½.

Spelter—\$4.15—\$4.12½-

Patents.

The following patents granted March 25 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Method of making oxids of tin and lead, C S. Lomax. Everett, Mass.; fluid pressure engine, Cyrus Robinson, Edgewood Park. Pa., assignor to Westinghouse Machine Company, East Pittsburg, Pa.; coke handling apparatus, E. N. Trump, Syracuse, N. Y.; duplex steam pump or other duplex steam engine, C. C. Worthington, Dunnfield, N. J.; electric metal working apparatus, G. D. Burton, Boston; machine for making cylindrical cores for casting, G. J. Hoskins, Sydney, New South Wales; rotary engine, J. H. Houseman, Conrad, Ia.; ram, D. J. Morgan, Pittsburg; steam boiler, Gottlieb Raissle, South Bend, Ind.; apparatus for the manufacture of compound wire bars by electro deposition, R. D. Sanders, Blackheath, England; charging mechanism for blast furnaces, David Baker, Chicago: steam boiler, H. P. J. Earnshaw, Hyde Park, Mass.; boiler feeder, Nelson Curtis, Boston; steam boiler, Carlos Holly, Lockport. N. Y.; method of making allovs, Edward Keller, Baltimore; rotary engine, P. G. Kennedy, Philadelphia; revolving cylinder explosive engine, J. D. McFarland, Jr., San Francisco, Cal.: float gauge, H. P. Tauber, Brooklyn; locomtive, S. M. Vauclain, Philadelphia, assignor to Burnham, Williams & Company, same place; method of circulating water through tuyers and coolers of blast furnaces, W. J. Foster, Darlaston, England.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including March 31, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS
Transit	769,033	494,375
Tidewater	201,585	110,970
Southwest	57,114	286,937
Eureka	34,848	1,007,702
Buckeve, Macksburg oil	3,046	383,644
New York Transit	360,479	
Southern	750,101	....
Crescent	190,039	....
Total	2,265,310	2,293,447
Daily averages	78,925	76,448

LIMA.

Buckeye / Indiana Local Division	1,767,160	1,543,832
Daily average	58,905	51,461

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
March 26	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
March 27	1.30	1.15	1.15	0.83	0.80	0.80
March 28	1.30	1.15	1.15	0.83	0.80	0.80
March 29	1.30	1.15	1.15	0.83	0.80	0.80
March 31	1.30	1.15	1.15	0.83	0.80	0.80
April 1	1.30	1.15	1.15	0.83	0.80	0.80

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 16 c
Copper, light bottoms	5 c
Heavy Composition	9 to 10½ c
Brass Turnings	6½
Heavy Brass	7 to 7½ c
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	[illegible]
No. 1 Pewter	16

BOILER SCALE SOLVENTS.

BY D. B. DIXON.

A BOILER free from scale and corrosion is greatly desired by all engineers, but is a very difficult thing to attain in practice. Boiler feed water is never found chemically pure, always containing foreign substances in solution and when boiled until it all escapes as steam. We find on the bottom, sides and tubes of the boiler a coating or deposit, which, if hard we call incrustation or scale; if in the form of a powder, we call it sediment. The water also holds mineral matter in a state of mechanical suspension. Incrustations are injurious to boilers because they are poor conductors; cause loss of heat and waste of fuel estimated from 15 to 40 per cent of the fuel used, dependent upon thickness of the scale; cause over heating of the boiler plates, which is sure, sooner or later, to burn out the meal and may result in an explosion of the boiler; and corrosion of the metal occurs rapidly in parts of the boiler upon which the deposits are more liable to accumulate. Incrustations due to the deposition of matter held in solution in the water have only been spoken of, as those are by far the most frequent. But it is known that a quantity of fatty matter in the feed-water of a boiler causes a deposit, and that this may lead to the destruction of the boiler, inasmuch as the part of the boiler shell, under the incrustation becomes more heated than other parts, and is apt to occasion rupture. Cases have come under the notice of boiler inspectors where oil, used to lubricate the cylinders, has been carried into the boilers with the feed-water, and, settling upon the furnace crowns formed a thin, hard incrustation, which resulted in burning the plates, followed by a crack necessitating repairs.

The best means to prevent incrustation is the purification of the water, or the removal of the incrustants before the water enters the boiler. In order to ascertain whether and how a certain feedwater can be purified to the best advantage, it is nceessary to have a sample of it analyzed. The sample should be put in a clean new jug and not be less than one gallon. There are certain things that may be done to prevent rapid scale formation in boilers located almost anywhere. That no scale will form is not to be inferred, but that the formation will be very much slower than if nothing is done to prevent it at all. When a new boiler is installed it is too often run without any move being made to prevent the formation of scale, and this continues until it is seen on the tubes and plates. Then a decided move is made, but usually it is too late, for the methods adopted are too mild to cope with scale forming on the scaled surface. If a boiler is taken in time and before the scale has accumulated to any appreciable extent—whether the boiler has just been thoroughly cleaned or is new does not make much difference—and a surface and bottom blow-off are opened several times a day, it will be found that the formation of hard scale will take place much more slowly. Even when the water is very bad, a good surface blow-off device properly placed in the boiler will prevent scale formation. There are many compounds on the market for preventing incrustation: some are very costly, and few of them are alike applicable to all cases. Some of them increase corrosion of the boilers while they prevent incrustation, and in the employment of others practical difficulties arise which render their use inconvenient and even dangerous. Slab zinc is often used in boilers and hot water tanks to prevent scale formation and the corrosive action of the water on the metal of which the tank or boiler is composed. The action appears to be an electrical one, the iron being one pole of the battery and the zinc being the other. Under the action of the current of electricity so produced, the water in the tank is slowly decomposed into its elements, oxygen and hydrogen. The hydrogen is deposited on the iron shell, where it remains. It will not unite with iron to form a new compound, but if any iron rust is present it will remove the oxygen from this and deposit the metallic iron on the plates. The oxygen of the water that is decomposed, instead of going to the iron, goes to the zinc, and forms

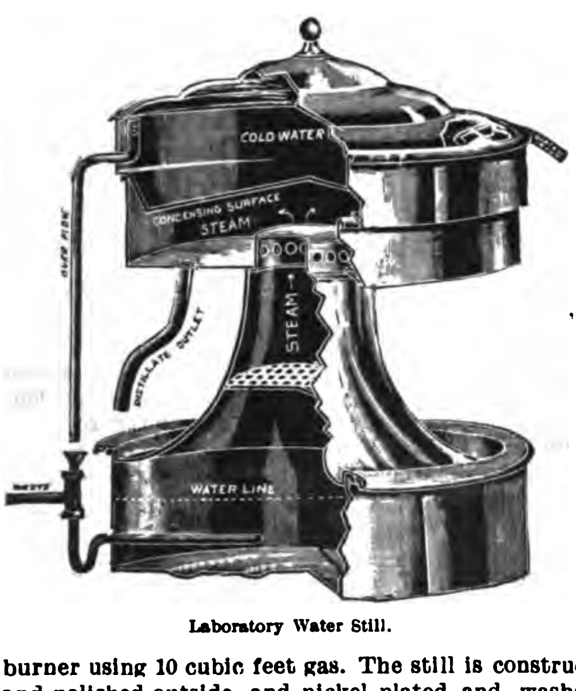
oxide of zinc, and in the course of time the zinc will be found to be almost entirely converted into oxide. On account of the action outlined, it is generally believed that zinc is always a good thing to prevent both scale and corrosion, and that it cannot be harmful to the boiler under any circumstances. But such is not always the case, and in making use of zinc the boiler should be frequently opened and the action carefully watched so that if any undesirable effects show themselves they may be checked in time to prevent serious trouble. Carbonate of soda is used to a very great extent as an "anti-incrustator," and it also prevents "pitting." A simple way of adding the soda is to dissolve it in the feed water prior to its injection into the boiler. A sufficient quantity will have been added in all cases where the water (sampled at the gauge glass top) will turn a piece of red litmus paper slightly blue, showing that the water is slightly alkaline. A very simple method of removing the incrustation of boilers is said to have been discovered by a French engineer. After extinguishing the fires, the boiler water is blown off very gradually, at the same time admitting an equal volume of cold water, so that the water-gauge shows no charge of level. As soon as the water has in this manner been sufficiently cooled down it is suddenly blown off. This latter operation is said to remove the major part of any incrustation which may be present, what remains being very easily detached by scraping. The cleaning of the boiler, must, however, be taken in hand immediately upon completion of the blowing-off operation, as otherwise the furstone will harden and adhere again to the boiler plates.

Kerosene oil possesses properties which make it useful in removing old scale from the shell and tubes of a steam boiler, and it is extensively used for this purpose. But, unfortunately it is not always applied judiciously, hence the many failures attending its use. It can also be used to prevent the formation of scale. We have seen wheelbarrow loads of scale loosened from the shell and tubes of a boiler during a week's run, after kerosene oil had been applied. Three treatments with kerosene oil during three weeks' time left all parts of the interior of the boiler "metallically clean". The greatest difficulty experienced in the successful use of kerosene oil for removing scale is that the quantity usually applied is too small to be of perceptible benefit. Kerosene oil is highly penetrative, and it will penetrate through a considerable thickness of any porous substance—especially boiler scale. Ordinary kerosene oil will wholly evaporate if kept at a temperature of about 200 degrees. For this reason it is of little benefit if fed into a boiler where the temperature is higher than this, because it will soon evaporate; while it remains it will rest on the surface of the water—very little being carried below the surface by the circulation of the water. To make kerosene oil effectual in removing scale from the inside of a boiler, from a feed water heater, or other place where scale has accumulated, it should be applied in liberal doses and at a time when the boiler, heater, or other device is comparatively cold. In using kerosene oil for removing old scale from a boiler, it must be used with some judgement else the loosened scale will gather on the fire sheet, or between the tubes and injurious effects may result. When the scaled boiler is open and dry, the kerosene oil may be applied, to the extent of a gallon or so, to the lower rows of tubes, using a syringe for the purpose. If the scale is thick and porous it will readily absorb the oil—if the scale is dense and close grained more time should be allowed for the oil to penetrate. After a sufficient quantity of the oil has been introduced the boiler should be closed up filled and run for about a week, then opened and the loose scale cleaned out. Another application of oil should then be made and the same process gone through with. This method will effectually clean the scale from a boiler in the course of a very few weeks.

Another way of applying the oil has been used to good advantage. When the boiler is empty put into it about a bucketful of kerosene oil, then let the boiler fill very slowly. The oil will float on top of the water and be absorbed by the scale as they come in contact, until all the oil is assorted. In this way the oil can be applied in greatest quantity to the scale which is nearest to the bottom of the boiler. A few such applications will effectually loose all the scale. Kreosene oil acts for this purpose, by reason of its penetrative power, working through the scale until it comes in contact with the iron, thus over-coming the adhesion between the scale and metal.

When heat is applied to the boiler the oil soon begins to evaporate and by its expansive force further loosens the scale and forms cracks in it, through which the water enters until reaches the metal, after which the force of the steam further assists in breaking up and removing the scale, which will fall off in chunks leaving the tubes and shell metallically clean where the breaking up process has taken place.

An absolutely clean surface inside of a boiler is not desirable. A thin incrustation not thicker than an egg shell, near the firing, is not injurious. It is frequently of benefit even, as it protects the boiler shell and tubes from the influence of injurious components of the feed water. But after all has been said as to the merits of the various boiler scale solvents and preventers the only sure, satisfactory and rational course to pursue is to have the feed water analyzed and a physic made to suit its requirements. Any and all solvents—with the exception of kerosene oil—should be introduced gradually and continuously with the feed water. Usually, all that takes place when a compound is doing what it is supposed to do, is that the scale or deposit is rendered soft and comparatively easy to remove. The boiler requires regular cleaning and scaling just as if no compound were used. This is not always done, however, for it is thought by some that when a compound is used all the work on the part of the engineer or fireman in removing the scale and keeping the boiler clean is being amply accomplished by the compond. And, if we are to believe all that is sometimes told us by the wise agents selling compounds, we would certainly be led to think this was so. There are devices in the market, for feeding boiler compounds, which may be procured from most any dealer in engineers' supplies.



Laboratory Water Still.

Water Still—About five years ago McKenna Brothers placed on the market an ore grinder, which has given universal satisfaction. They have designed a continuous, automatic, water still which, for simplicity of construction, economical operation and durability, combined with a moderate cost, make it one of the most practical stills on the market, and a laboratory necessity. The water flows through inlet tube (see cut) and enters boiler through overflow tube. A constant water level is obtained by waste tube. The still should be heated by a Bunsen burner or small gas stove. The steam then rises through perforated hood and is cooled by water entering still. The distilled water flows away through outlet tube. Capacity, three quarts per hour with burner using 10 cubic feet gas. The still is constructed of heavy copper, nickel plated and polished outside, and nickel plated and washed with silver inside. It has no soldered seams and is designed to stand the roughest possible use without damage. Every part is easily accessible for cleaning after using muddy water. It all comes apart as easily as a nest of beakers. Owing to its simplicity of construction it is also well adapted to domestic use by families who desire an absolutely pure drinking water.

HORSE POWER IN GAS ENGINES.

BY ALBERT STRITMATTER.

THE gas and gasoline engine manufacturer is often asked by a prospective customer what is the bore and stroke of his engine, to compare the figures with those of other manufacturers and ascertain which engine will give the most power. What are the things which affect the power of an engine? Are the bore and the stroke the only things to be considered? At first thought it may seem that an engine with the larger cylinder cubic contents would develop the more power, because of its ability to take in a larger sized charge, but this is not the case. The quality of the charge, the compression, the time of ignition, the exhaust, the port or valve areas, the fly wheels, and other things affect the power to be developed by an engine, whether we are considering indicated or actual horsepower.

The force derived from the explosion of a mixture in the gas engine cylinder depends largely on the ratio of the air to the gas or gasoline. The exact ratio to be secured varies with the quality of gas. About one volume of gas to six or seven of air is generally considered the best practice, although a mixture remains explosive within a considerable range on either side of this ratio. Another thing affecting the power developed is the compression. The maximum pressure derived from a proper mixture of gas or gasoline and air is from four to five times the pressure at which the explosion takes place. Suppose we have two engines of identically the same make and size, and the compression in one is 40 pounds to the square inch and in the other is 50 pounds. Assuming that five expresses the relation of the maximum pressure to that at the time of ignition, these engines would have a maximum pressure of 200 and 250 pounds to the square inch, so that the engine with the greater compression, other things being equal, would develop the greater power.

Perhaps more troubles with the lack of power in gas engines are due to the improper ignition than to any other one thing unless it is those due to improper mixtures. Too early ignition causes the engine to fire against itself, killing a part of the power which would otherwise be developed. Too late ignition causes the engine to drop in power for the same reason that low compression does. It allows the piston to reach the inner dead center, at which point the compression is greatest, and then to start on its outward stroke, thus reducing the compression before ignition takes place. Ignition should occur sufficiently before the crank reaches the inner dead center, to allow the greatest pressure to occur just as the piston starts on its outward stroke.

Many an engine which is in otherwise perfect condition to develop its maximum possible power, is provided with a poor exhaust system. It may have many bends in the pipe, or it may be too long. The pipe may be too small in size. The muffler may be stopped up with burned grease and oil. The exhaust valve and ports may be partially clogged with dirt and grease. In other words, for some reason or other the exhaust gases may not be able to escape readily. It therefore requires some power to force them out, possibly making considerable compression in the cylinder on this stroke. Or, the gases may be forced back into the cylinder by the back pressure in the exhaust passages, thus contaminating the incoming charge to such an extent as to cause a weak explosion or failure to ignite at all. The object of using an exhaust pot is to provide a large space near the engine into which the exhaust gases can readily escape from the engine and then make their way out of the pipe from the pot. Sometimes, through ignorance of the function of the exhaust pot, it is located at the end of the exhaust pipe or at a considerable distance from the engine. This, of course, should not be done, as it should be located very near to the engine in order to do any good.

As may be inferred, the sizes of the exhaust ports and valves have much to do with the free escape of the burned gases. If the valves and ports are too small the

gases cannot escape readily. In this connection may be mentioned the fuel valve also. This should be of ample size. If the engine has difficulty in securing a proper sized charge, owing to the valve being too small, the chances are that it will not secure large enough charge and thereafter will drop in power. There are many engines in use today which, if, provided with larger valves, would develop considerably more power.

The flywheels also play an important part in the development of power in a gas engine. To make it evident, suppose we had an 8 horse-power engine with flywheels weighing about 250 pounds a piece. Suppose we took off these flywheels and put on wheels weighing only 75 pounds a piece. Would the engine develop the same power? This is especially true in four cycle engines in which an impulse is received only at every other outstroke of the piston. The fly wheels are relied upon to store up the energy and carry the engine on, delivering the stored-up power (momentum) when needed. This also gives a much closer regulation in speed than could otherwise be secured.

The internal friction of the engine also affects the actual power developed. This is one reason why it is desirable to have an engine with smoothly running bearings. They take less power, as there is less friction to overcome in them. It is also a reason why the simple engine should be chosen in preference to the complicated one. Some engines operate the igniter continuously whether the engine is taking a charge or not. Others cut out the mechanism operating the igniter, except when the charge is to be ignited. This results in less friction load and increased life and power, as well as decreased fuel consumption.

Bearing in mind the difference between the indicated and the actual horse-power will enable us to account for the differences in rating of some engines of practically the same size. One manufacturer may rate a certain engine at, say, 22 horse power. Another manufacturer rates perhaps a larger sized engine at only 18 horse-power. It may actually be the case that the smaller engine develops the greater power, and this is not infrequently the case. But, on the other hand, the horse-power rating may be indicated horse power and the 18 horse-power rating may be actual horse-power. The user of an engine is rarely interested in the indicated power from the fact that he wishes to know only the net horse-power. Of course, it is sometimes desirable to know the mechanical efficiency of an engine, but if one knows the actual horse-power of various sizes of engines and the approximate fuel consumption of each, he can compare the engines on a satisfactory basis, whereas the mechanical efficiency of an engine must generally be accepted at what the manufacturer states it to be, for the average user has no means of testing the engine to determine its efficiency.

Some manufacturers, however, do sell their engines on indicated horse-power, and some salesmen do not take the trouble to explain to their customers the difference between indicated and actual horse-power, leaving it to be inferred by the customer (if he happens to know the difference, or to think of it) that actual horse-power is intended. When the contract is written the salesman is very careful to see that actual horse-power is not referred to therein.

There is another term which is sometimes used by gas engine salesmen in referring to the power of their engines, and that is the "nominal" horse-power, as a 15 nominal horse-power engine. This is rather an indefinite expression but usually means that the engine which is so rated develops more than that in actual horse-power. The reason for so rating an engine is that in practice it is shown to be better not to run an engine to its full capacity as it will last much longer if not run at full load continuously, although the fuel consumption is slightly increased. This increase in fuel consumption, however, is very little and is overbalanced by the increased life of the engine. It is for this reason, as well as to enable them to put in more machinery later on, that most purchasers buy an engine of five or 10 horse power, or even more, larger than they actually require. Most engine manufacturers, however, rate their engines at some less than the actual power they will really develop, and some call this the nominal horse-power. Perhaps the better way to do, and the one more likely to be understood, is to rate the engine at a certain actual horsepower and state that it will develop, say, five or 10 horse power more than the rating.

AUTOMOBILES. II.

BY HIRAM PERCY MAXIM.

PUBLIC vehicles for several passengers—This is the omnibus. Its service consist principally in a regular schedule of omnibuses operating on streets or routes not provided with street cars. In some cases street car lines are not economical, and in others the streets are prohibited to electric cars, yet in each, passenger transportation facilities are imperative. In almost every one of these cases the limitations of the horse have long been the cause of extremely unsatisfactory service, and demands for improvements in motive power most insistant. The characteristics of the service have been found to be easily met by automobiles in every case, and several lines are being equipped at the present time. The aggregate mileages per day per bus are, as may be expected in any continuously running vehicle, relatively high. This is not of much importance, however, as in this service the vehicle periodically passes the home point. The maximum mileage before return to home point is of greatest importance, and is the factor which determines the form of motive power most suitable.

This mileage is found to vary greatly. In some cases it is three miles and in others 30 miles. The lay-overs at the home point are invariably short, owing to the desire to keep the number of buses down, and the consequent necessity to keeping them continuously running. The wattages have been found to depend upon the number of stops and starts and the nature of the traffic on the streets over which the routes run. Where the passengers picked up and dropped are few per mile and the traffic conditions open, the service wattage rarely is over 20 per cent increase over the level wattage. Where, however, the passenger stops are frequent and the traffic conditions crowded and tending to increase the number of slow downs and accelerations, the increase amounts to much higher figures. On Fifth avenue, New York, the wattage averages in the vicinity of 50 per cent increase, while in winter, during a snow storm or before the avenue has been cleared, it amounts to 150 per cent and over.

The motive power almost exclusively used to date is the electric. It is, of course, limited to routes having mileages between returns to home point within the practical possibilities of the batteries. The batteries are changed each time of passing the home point, or every other time, as the case maybe, by mechanical elevators and transfer apparatus, a freshly charged battery being substituted for the discharged one. In all of these cases where the installation has been carefully done, it has been found that the automobile bus was infinitely superior to the horse-drawn one, and important future development seemed inevitable. Where, however, the routes are such that the product of the mileage before return to home point and the service wattage per ton mile is beyond the practical limits of the storage battery, or where battery changing and charging facilities are not practical, the electric system is not suitable, and the engine propelled vehicle becomes best.

Gasoline engine propelled omnibuses are in use in Europe in several places, and steam buses have been frequently used in this country. All have not been successful from a financial standpoint, but every one has been of immense success so far as the improvement of transportation facilities went. The financial failures we may take as defects in handling more than defects in the principles involved, as what has been accomplished by the automobile bus has been too much of an improvement over horse service to be overlooked or forgotten.

Freight carrying vehicles—As already stated, this class is divided into three branches. So far as motive power is concerned they may be taken together, as their work is near enough alike to admit of it.

The work to be done is the collection and distribution of relatively light miscellaneous merchandise, or as it is better known, "express matter." There is no more difficult service for horses. The points of collection are scattered all over a city, as are also the points of distribution. It makes no difference whether it is the same

matter that is distributed that was collected, as the work of transportation is the same.

The aggregate mileages per vehicle per day have been found to vary considerably. This is due to arbitrary business reasons. For instance: the Pittsburg Express Company, in Pittsburg, and the Metropolitan Express Company, in New York, collect at and distribute from central stations located in different parts of their respective cities, and have arrangements with the street car companies to do the distance transportation between these points in electric express cars running on the street car tracks. Their wagon mileages are consequently relatively low.

On the other hand, the Manhattan Express Company, in New York, a local and suburban company, and the Adams and American Express companies do all their city transportation with horse wagons. In a large city this makes the mileage high. An idea of the mileages is obtained by the following, made from careful tests: In the down town district of Pittsburg, where the principal purchasing, and therefore collecting, is done, the average mileage of wagons engaged in express work is 8½ miles per day. The maximum of all those measured is one engaged in both distributing and collecting, and runs from virtually the Pennsylvania Railroad station out Fifth avenue and Forbes street to the Hotel Schenley, and then back over Herron Hill. The length of this run is 9½ miles. One trip per day is made.

The minimum is one confined to the down town district, and is 7 1-16 miles per day. This seems surprisingly low, yet it is a full day's work. It is doubtful if more than 15 per cent reduction in this time could be effected, no matter what the speed of the vehicle, as most of the time is taken in loading and working slowly through the other street traffic.

In East Liberty, the wagons doing principally distributing run an average of 19½ miles per day. In New York, wagons of the larger express companies doing distributing and and collecting between branch offices average 30 miles every day, the maximum measured being 40¼ miles and the minimum 16 miles. Not enough unformity exists to make it practical to plot general tendencies, as can be done in the passenger vehicle service. The lay-over characteristics are fairly uniform, and such as to immensely simplify the application of mechanical motive power. In the cases of collecting wagons in the down town districts of Pittsburg, for an example that can be judged fairly well, the total hours per day lay-over per wagon at the home point averages 2¼ hours. The maximum measured is 2 hours and 56 minutes, and the minimum is one hour and 30 minutes.

In East Liberty, distributing wagons lay over an average of 2 hours and 10 minutes at the home point. In New York, wagons doing 40 miles every day (requiring three changes of horses per day to do it), lay over a total of three hours at the home station and another hour at some of the important sub-stations, or 4 hours where recharging would be convenient as not. The minimum lay-over in New York express wagon service can be taken as 2 hours during the day; still a time enabling 75 per cent of a storage battery's complete capacity to be returned to it. The wattage increase in this kind of service is invariably found higher in the short mileage routes than in the long ones. In the down town wagons in Pittsburg, for instance, the average increase over level wattage is 69 per cent. In short down town routes of New York, it is, in cases that have been measured, 150 per cent.

In East Liberty the average is 25 per cent. In long runs in New York, it runs to about 29 per cent. The reason for this vast increase of the short over the long, is the almost universal bad stone paving in crowded down town districts, and the universal asphalt or good stone paving on long avenues. It has been found that accelerating a heavy laden wagon over pavements having bad holes, hollows and car tracks, requires many times the energy expenditure that is necessary on a clear stone pavement, filled with small and uniform hollows, or yet better, an asphalt pavement. The effect of these pavements on horse flesh depreciation is not appreciated even by express companies.

An interesting indication of this is shown by the fact that even with Pittsburg hills the wattage is less than in New York. This is due to more frequent use of asphalt in Pittsburg in the down town districts, and the almost universal asphalt in the

outer districts. In tests the writer has made of express routes, including Third avenue, the Bowery, Park Slip, South street and Fulton Market, in New York, where the paving is the worst the writer has ever seen, the service wattage was found to be 242 per cent over level wattage This was almost entirely due to the dense traffic and the continuous accelerations from almost standstills. For some unfortunate reason, the pavements are always the worst the denser the traffic, which aggravates the power expenditure trouble. With no horses' feet to provide for, these pavements could be good, and the present waste of power would be almost all saved.

Altogether it is seen that in this express service the conditions are favorable for the successful performance of mechanical motive power, even as we have it developed today. Especially would mechanical motive power show to advantage in what we called the long runs, owing to the ability to make speed. It is in these runs that the horse suffers most, both in hot and in cold weather, for it is here that speed is most wanted to compete with rail transportation. Long lay-over being universal at both ends of nearly all runs, power is easily re-charged, and only a moderate surplus is necessary, even with winter snow.

Up to the present time the motive power almost universal where automobiles have been used in this service—and there are hundreds at work today—has been the electric. Only in a very few cases, comparatively, has gasoline or steam been used. Where they have it is usually the distribution of purchases from private stores.

In all probability in express service, gasoline or steam, as the prime mover systems, would be able to show less saving in cost of transportation per ton mile than is the usual case in other work. This is due to the wholesale character of everything, where large numbers of vehicles are operated from one point as would be the case in express service. Power would be used in large enough quantites to pay to generate it from large units, which are very much more efficient than the engines of an automobile could ever hope to be.

Battery repairing and renewal would be done on a wholesale scale, which would materially decrease this most expensive feature that the electric system has. For these reasons it seems unquestionable, when it comes to the question of motive power for transportation of express matter, that the electric system offers the greatest number of advantages, and will for some time to come, be the principal motive power used. That it will always be so is not plain, as the law of the survival of the cheapest per ton mile, other things being equal, will be as inevitable in this as is the law of the survival of the fittest in nature.

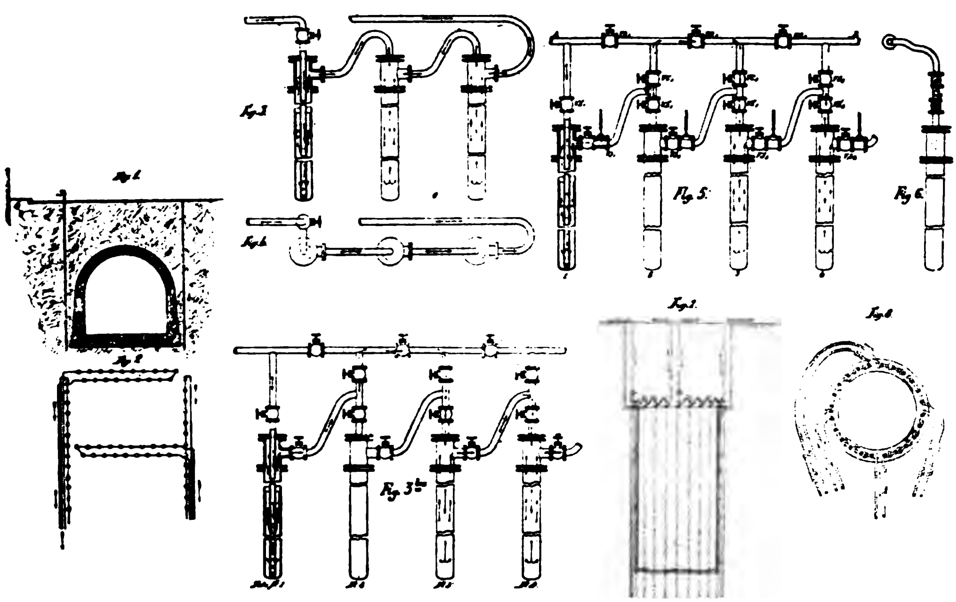
This completes the recital of the examinations and tests that have been made into existing transportation problems and the consideration of the suitability of the automobile for their improvement. In such a recital it is not possible, without taking up too much time, to go into the designs of existing automboiles, and study their detail suitability for work of the kind described. So an automobile including the best of all designs has been assumed.

From this recital it must be conceded that the mechanically propelled vehicle, independent of fixed tracks, is a development resulting frcm the need of better transportation, rather than because of any fad. Our cities have already spread to areas which make irregular transportation of passengers and merchandise over them most difficult. The automobile comes as a successor to a part of the work of the horse, just as the electric street car came as a successor to part of his work. From the very nature of our civilization it becomes an absolute necessity. The mechanically propelled street vehicle is as inevitable as was the mechanically propelled boat, railroad train and street car, and we might as well include such institutions among our fads as to include the automobile. When it comes to their manufacture, where we will build one for pleasure, sport, or fad, we will build one hundred for serious work.

APPARATUS FOR SHAFT SINKING BY CONGELATION.

BY A. GOBERT, Annales des Travaux Publics de Belgique.

IN their recent publication on sinking a shaft by the congelation process at the Auboue iron ore mine, attention is drawn by Cavalier and Daubine to a serious defect in the existing apparatus for this work, namely, the stoppage of the circulation of the incongelable liquor in one or more of the congelation pipes, and the difficulty in the way of detecting such a stoppage. The usual practice is to pass a cooled solution of calcium chloride through a series of vertical double pipes, the liquor being delivered from the refrigerator into a distributing crown communicating with the inner pipes, whilst a circulating pump draws the return liquor from the collector connected with the outer pipes and forces it through the refrigerator for use over again. At the Auboue mine the collecting and dstributing crowns were constructed of steel tube and connected with the corresponding outer and inner pipes by means of lead pipes, fitted with taps so that any vertical pipe in the series could be excluded from the general circulation as and when desired. It was, however, found that,



after a certain time, the temperature of the external air having fallen below zero Centigrade, considerable difficulty arose in determining whether the liquid continued to circulate in the pipes. As a general thing, stoppage of the circulation is evidenced by the disappearance of hoar frost on the heads of the pipes, but when the atmospheric temperature is sufficiently low, all the pipes are coated with rime, even though the circulation of the chloride has ceased in some of them. Thus, at a depth of 102 metres, the circulation had stopped in some of the pipes, notwithstanding the appearance of rime. After taking apart the inner set of pipes and cleaning up, the circulation was restored, but hoar frost did not make its appearance until the third day after re-starting, a circumstance proving that the surrounding earth had once more grown warm in consequence of a long standing stoppage of the refrigerating liquor.

To remedy the inconveniences arising from such defective circulation, the author has designed the improvements illustrate in the accompanying drawings. The refrigerating liquid, after having circulated in the first refrigerating liquid pipe, (fig-

ures 3 and 4), is passed into the second pipe, thence into the third, and so on; when a certain number of pipes have been traversed in this way, the liquid is led into a return pipe, which conveys it back into the refrigerator. In this manner a uniform quantity of the liquid traverses each of the pipes in a given time; and if the circulation be stopped in one pipe, it will also cease in the others, and the stoppage will at once be indicated by the circumstance that liquid passes through the return pipe into the refrigerator. Fig. 3 b represents the arrangement to be used when it is desired to reserve the faculty of excluding one or more of the pipes from the circulation without affecting the rest. The arrows show the direction of the current from 1 to 3 when 2 is cut out.

Figures 5 and 6 relate to a device for enabling the temperature of the refrigerating liquid to be read at the point of entry and exit in each pipe. By noting the indications furnished by the thermometers, and taking into account the volume of liquid passing through each pipe, it will be easy to calculate the amount of heat abstracted from the surrounding earth by each pipe, and to follow exactly the progress of the congelation. It will be evident that the first pipe acts more energetically than the second, this in turn more than the third, and so on. This circumstance is favorable in the case of tunnels and trenches, since it enables one to congeal first such portions as are to be removed before the others. Figures 1 and 2 show the disposition of the congelation plant in the case of a tunnel, the arrangement being such as to permit the simultaneous creation of several shields, in such a manner that, the first shield having been entirely removed in the work of excavation, the second shield affords full protection against any irruption of water or caving of earth. The second shield is not moved until after erection of a third, and so on.

Figures 7 and 8 represent the disposition of the congelation plant in the case of a mine shaft. It has already been stated that the first of the pipes acts more energetically than the second, and so on; but if it be desired to insure uniformity in the thickness of the wall of ice, the following arrangement may be adopted:—

First—The direction of the current of refrigerating liquid may be changed by allowing it to enter the annular space between the inner and outer pipes of the last of the series, and drawing it off through the inner tube of the first of the set.

Second—The circulation may be allowed to commence alternately in each set of pipes.

Third—The various pipes composing the entire series may be set at different distances apart, so that the interval between each two diminishes in proportion as the distance from the source of supply of the refrigerating liquid increases.

They Need to Know—Reading Railway officials express no surprise at the reported statement of August Schulze, of Berlin, who several months ago imported several thousand tons of anthracite coal with a view to its introduction into Germany, that the coal was satisfactory because of its hardness. Mr. Schulze, who bought hard white ash coal because it was somewhat cheaper than the free-burning coal of the Reading, was advised at the time of purchase not to take that kind of anthracite, as it was likely to prove unsatisfactory. His reply was that there were American stoves in Germany and that he anticipated no trouble To this answer was made: "But you do not have the American draught!" It is explained by Reading officialf that the trouble was not so much due to the coal as to the want of proper knowledge how to use it and the insufficient draughts. In the case of George Stevens & Son, of Stettin, Germany, who also imported large quantities of Reading anthracite aboul the same time, but who heeded the advice of the officials and took the free-burning coal, no complaint has been heard.

CHANGES IN FOUR YEARS.

J. B. JOHNSTON.

ANALYSIS of the changes in the latest edition of the Directory of the Iron & Steel Works of the United States, just issued, makes some significant showings not only as to the increased productive capacity of the country, but to the changes of methods of manufacture, as compared with the edition of 1898.

In the 1898 directory, it is stated that only 370 out of a total of 420 blast-furnaces then erected were capable of production, with a total tonnage capacity of 18,000,000 gross tons if pushed to full capacity, which, from the nature of things, could not be attained, as some of them at different times would be out of blast, and accidents and other causes would not permit the full estimated capacity to be attained every 24 hours in a steady run.

In the 1901 edition—complete to January—there are 406 furnaces noted, with an estimate capacity of approximately 24,000,000 gross tons. Of the entire number of furnaces given, six are stated to be unlikely to ever again produce iron, so that we have the average monthly capacity of each of the 400 furnaces remaining, then as 5,000 gross tons, which indicates an enormous expansion of the daily capacity of furnaces within the last ten years. In 1878, the capacity of the Lucy furnaces of Carnegie Brothers & Company, limited, which was the largest producer in the country at that time, was only 91 tons. The next year this was increased to 132 tons, and then began that wonderful expansion of capacity consequent upon the erection of enlarged furnaces at Bessemer and elsewhere, and which is still going on until we now have furnaces that have a capacity in actual work of over 800 tons in 24 hours. Where the limit will be reached is as yet problematic, but that it is not far away seems probable, if it has not already been attained.

However, if the capacity of furnaces has been increased, there is also a notable change in the quality of the iron produced. There has been a notable increase of production of basic pig-iron, with no appreciable decline of charcoal, although the number of furnaces has declined. Those still active have been increased in capacity, following the ideas that have so remarkably changed practice in the operation of coke furnaces.

Since 1898 seven of the then considerable Bessemer steel plants have passed out of existence, but the capacity of others has been increased and a number of small converters have been brought into existence, chiefly for steel-casting making rather than rails and Bessemer products of a general nature. The annual capacity of the whole number has increased from 10,633,000 gross tons in 1898 to 12,998,700 gross tons in 1902. During the same period the number of open-hearth furnaces, erected and in course of construction, has increased from 281, embraced in 99 plants, to 403 completed furnaces and 112 plants in 1902, 40 furnaces building, 13 plants projected, and six furnaces being added to existing plants making a grand total of 449 furnaces in existence and in course of erection, leaving the 13 projected plants out of consideration. Of the 403 producing furnaces., 167 make acid open hearth steel and 236 basic steel. The tonnage capacity of all combined is estimated at 8,289,750 gross tons, or just about two-thirds of the capacity. of the Bessemer tonnage capacity. but a considerable part of this is used in making castings and tool steel. The capacity of open-hearth furnaces increased in the four years from 3,552,250, or an increase of 4,737,500 gross tons.

There has been a notable increase also in the use of steel for castings during the four years under review. Whereas in 1898 there were 47 plants prepared to make steel castings, there are now 56 and, all told, the tonnage capacity has increased. A number of steel casting foundries use Bessemer steel for castings, 114 use the crucible process. The number of open-hearth castings is constantly increasing, but the tonnage in castings produced is not given.

The annual tonnage capacity of crucible steel has not appreciably increased, tool steel makers using more and more high-carbon open hearth steel for common pur.

poses. This tendency is on the increase, so that crucible steel is more and more being reserved for only high-grade tool steel.

Rail mills have decreased from 56 to 45 plants, but tonnage capacity has materially increased. It is worthy of note that there has not been a distinctively new Bessemer plant erected for rail and beam making in the four years elapsing since the previous edition of the directory was issued. The tonnage in structural steel has expanded enormously, but the increase has been in the old plants rather than in the creation of new ones. There are, however, 67 plants that produce this material in some form but they are, with rare exceptions, all under one management in the main.

In plate, sheet and skelp mills, there has been a decline from 230 completed mills, one partly built and one projected, to 223 completed mills, but there are 13 building and two projected.

Tin plate plants have declined from 69 completed, one building and one projected, to 55 completed plants. 7 building and one projected. There has been a declension also in the number of wire-nail plants from 79 to 64; an increase in the number of wire rod plants from 24 to 32, with four building and one projected. Bloomaries and forges have declined from 10 to 8, all of which are independent of rolling mills.

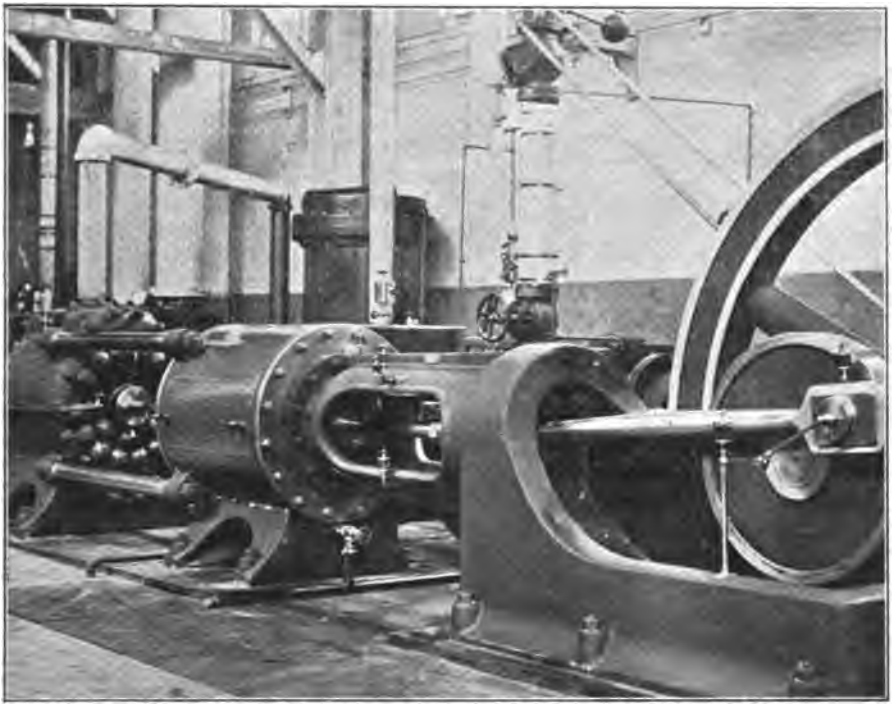
Comparing the edition of 1898 with that of the one just issued, it reveals that the metallic industries are forging ahead in output capacity at a marvelous rate, but also that the industry is being more and more concentrated into the hands of a comparavitely small number of men. That this is due to the fact that enormous capital is now required to engage in the industry, few will contest, but those who can recall the old days when mills were distributed in a number of small communities, giving sustenance to whole neighborhoods, will perhaps regard the change with feelings of regret. The economics of the time dictate relentlessly that plants must be located at points where the maximum economies can be obtained, and in pursuance of this law, it is apparent that gradually, but none the less certainly, a number of small plants will, in the course of time, be abandoned as capacity is increased in the great producing centers, where the cost per ton is less than in out-lying communities, where cost on the unit of output must necessarily be larger than in centralized establishments.

NOTES FOR THE CHEMIST.

Carbon By Direct Combustion—Rudolf L. Leffler. F. C. S. (Chem. News, March 14, 1902.) The author finds the direct combustion of steel to be a practical procedure and desirable where correct results must be rapidly obtained and when the sample contains elements which invalidate Eggertz's color test. Crush the drillings, pass through a 20 mesh sieve and then through a 40 mesh sieve. From the portion retained by the latter, weigh 2.5 grams and mix with 6 grams of red lead. (a 10 gram blank should not exceed 0.010 gram.) Transfer to a porcelain boat, (4x¾-inch) and place in water bath until apparatus is ready for ignition. The combustion is made in a porcelain tube (20x1⅛) containing a little CuO, and fitted at one end with means for purifying incoming air or oxygen and at the other with a simple drying tube. No special tubes are required, such as lead chromate for absorbing sulphur compounds or anhydrous copper sulphate pumice for hydrochloric acid, as the former never escape and the latter is not present. When the combustion tube is at a red heat, connect the potash bulbs, insert boat and quickly replace stopper. No violent reaction takes place. Attach the aspirator and the combustion requires no further attention. With a hot tube, combustion is complete in half-an-hour, even when air only (about 2½ liters) has been passed through the apparatus. The furnace should be very hot. The author uses one of the Bunsen type, in which the customary clay tiles are replaced by asbestos arches. When drawn from the tube, the contents of the boat are soft and can be easily removed. The method is recommended for special steels, such as tungsten, and chromium-tungsten-iron alloys. The author gives results in steels containing 0.15 to 1.87 per cent carbon, comparing above method with results by the usual method, (solution of sample in acid copper ammonium chloride and combustion of carbonaceous residue) Results check very closely.

An Efficient Compressor.

THE accompanying illustration represents a Class D. S. C. air compressor having duplex steam cylinders and two stage air cylinders, with inter-cooler, built by the Franklin Air Compressor Works, of the Chicago Pneumatic Tool Company, with offices in the Monadnock block, Chicago, and No. 95 Liberty street, New York, installed in the Brooks plant of the American Locomotive Company at Dunkirk, N. Y. This compressor has steam cylinders 20 inches diameter by 24 inch stroke; low pressure air cylinder 27 inch diameter by 24 inch stroke: and high pressure air cylinder 16 ½ inch diameter by 24 inch stroke, representing a piston displacement of 1580 cubic feet of free air per minute at a working speed of 100 revolutions.



Chicago Pneumatic Tool Company's Class D. S. C. Compressor.

The illustration shows the first of this type of machine that has appeared in the press, it being especially noteworthy that the compressor demonstrated, under test, one of the most efficient performances ever attained by a compressor of this type and capacty. Similar compressors have recently been installed at the shops of the New York Central Hudson River Railroad Company, at Depew, N. Y.; Lake Shore Michigan Southern Railway Company, at Collinwood, O.; New York, New Haven & Hartford Railroad Company, at New Haven, Conn.; Delaware, Lackawanna & Western Railway Company, at Kingsland, N. J.; Terre Haute & Indianapolis Railway Company, at Terre Haute, Ind.; Norfolk & Western Railroad Company, at Roanoke, Va.; Erie Basin Dry Dock Company, Brooklyn, N. Y.; United States Navy Yard, Boston, Mass., (three machines.) The manufacturers build this type of compressor in a number of sizes and also duplex single types, both steam driven and belt actuated.

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EDITORIAL COMMENT.

Steadying the Markets—The report of the sale of Bessemer pig iron for advance delivery to the companies of the United States Steel Corporation, by the Bessemer Furnace Association, indicates to what extent the ruling factors in the iron and steel industries are co-operating to steady prices. The details of the transaction are private but enough was made known officially to show that the pig iron producers are as willing as the big combination to aid in preventing any possible inflation, or tendency to wildness in the movement of either materials or values.

The tonnage reported sold for delivery extending for six months beginning with October next was 200,000 tons and the price named was $16.50, at valley furnace. It is approximately $1 per ton below what the furnace operators might have secured from individual consumers exclusive of the Carnegie Steel Company and the fact that the lesser value was accepted seems to be a guarantee that the influences at work to hold the markets steady for the beneficial effects of permanency will be uniformly successful.

When it is remembered that a good percentage of the 200,000 tons just sold is for delivery next year the outlook appears to favor a continuance of the ruling range of values at least for the first quarter. That must be taken to mean that regardless of the length of time the strong demand which has existed for so long continues there will be no weakening of the efforts to maintain values that are equitable to both producers and consumers. Standard Bessemer pig at $17.25, Pittsburg delivery, cannot be regarded otherwise than as an extremely conservative cost when the prices on all other commodities of the iron and steel markets are considered. With Bessemer billets at approximately $33 per ton, at mill, and the supply so short as to compel the importation of foreign material, Bessemer pig at that rate is cheap. On the other hand with billets so high priced as $33 for a minimum, rails at $28 seem cheap also.

The sale of so much material extending over such a long time may be taken as a certain indication of stability for at least that length of time but to the outside observer it looks somewhat like a sacrifice for the Bessemer Furnace Association to dispose of a heavy tonnage of material at so much less than hundreds of consumers would have willingly paid for portions of it. But if the speculative tendency is to be held in check perhaps the United States Steel Corporation and the sellers have taken the best method, if heroic, to attain their end.

The Furnace Hands' Demands—The notice given to the blast furnace operators of the United States by the association of blast furnace employes may lead to something disagreeable in the way of a suspension of operations at the source of the raw material supply, but there is abundant ground for the hope that production of pig iron may not be stopped. The demand for a work day of eight hours with pay for the twelve hour day seems excessive, and unless relinquished or modified is likely to be met with defeat. The practice in presenting such demands, however, permits of such wide latitude in accepting terms of settlement that at first sight it might appear that the furnace employes either want the shorter work day or the higher wages, and will take either but will not risk a prolonged fight to secure both. In fact it is generally understood in the case of omnibus demands that the workers are simply providing for a possible contingency in the way of establishing a basis of adjustment when the time arrives for direct action.

The eight hour day is only one of the many cure-alls put forth from time to time by self styled labor fakirs for the ostensible benefit of the workers, but the workers themselves have almost outgrown the influences of the panaceas. To radically alter or abridge any system, economic or otherwise, requires time and harmony of judgment. For the most part the labor fakir is not prepared to exercise judgement, especially if that requires the abandonment of any one of his pet theories. To the average leader of labor the desire for a given industrial condition is made to take the place of judgement, which accounts for the many wrecks of plans that to his mind contained the elements of success.

The eight hour day may or may not be desir

able, according to the angle from which it may be viewed by the eligible millions interested in its application; but desirable or not, it is not a remedy for anything, economically, and cannot be twisted into a cure-all for the day laborer. When the demand for the eight hour day and the twelve hour wage in one has crystallized, the furnace employes will realize that then better than at present, and when that day arrives the labor leader will be called upon for some explanations which will not be so ready as are the reasons why the men should ask the maximum wage for the minimum day of work.

Personal.

Auditor Charles Schoolar of the Sloss-Sheffield Steel & Iron Company, has resigned, while the resignations of J. J. Grey, furnace manager at Sheffield and Florence, Ala., and others are expected. President E. O. Hopkins announces that he goes out on account of a misunderstanding between himself and some of the New York directors. He adds that he has put the plants of the company in the best physical trim they ever enjoyed and that he has kept the company's affairs removed from any speculative tendency.

After May 1, Edwin N. Ohl will be connected in an official capacity with the well known firm of J. W. Rhodes & Company. Mr. Ohl at present is the general manager of the Atlantic Iron & Steel Company, of New Castle, and a member of the board of directors of the Republic Iron & Steel Company. He is also general manager of the Connellsville Coke Company.

J. J. Shannon, former furnace manager in the Bessemer field for the Tennessee Coal, Iron & Railroad Company, has gone with the Alabama Steel & Wire Company, at Ensley, and reports have arisen of a steel mill, two blast furnaces and ore and coal developments by that corporation on its ore and coal land near Bessemer and in Cherokee county.

Edward Williams, of Youngstown, has been appointed general manager of the furnace department of Pickands, Mather & Company, of Cleveland. He has been the manager of the Sharpesville and West Middlesex furnaces of this concern.

Ernest Porter, superintendent of the blooming mill of the National Steel Company, Sharon, has been appointed to the superintendency of the open hearth department to succeed Samuel Moffit. Walter A. Trinler, of Pittsburg, son of Manager Trinler, succeeds. Mr. Porter.

The circular of the United States Steel Corporation dealing with the plan to retire $200,-000,000 of preferred stock and issue $250.000,000 5 per cent bonds, will be issued this week. Some legal details are still unsettled.

OBITUARY.

JOHN MEILY—John Meily, of the firm of J. & R. Meily, of Lebanon, owners of the Lebanon Valley furnaces, died April 3 from heart trouble, aged 75. Mr. Meily was engaged continuously in the manufacture of iron for 50 years. He served in the legislature in the 50's; was burgess of Lebanon in 1880, and was a delegate to the republican state convention.

LESTER M. BIGGS—Lester M. Biggs, a pioneer boiler manufacturer and founder of the Biggs boiler works, at Akron, O., died suddenly of heart disease at his home in East Akron, April 1. He was 59 years of age.

Sheet Maker's Movements—Another step has been taken by the independent sheet steel manufacturers for a permanent supply of steel billets. The Portsmouth Steel Company, of Portsmouth, O., has been incorporated in West Virginia with a capital of $300,000. This is the company composed of independent sheet mill owners who will jointly operate the old Burgess open hearth plant of the Crucible Steel Company. With additions now being made to it, the plant will be able to turn out about 50 tons of billets a day.

The new company, according to the incorporation papers, is composed of A. F. Baumgarten, T. A. Watkins, G. R. Wallace, B. H. Hirschfield, W. L. Glessner, N. E. Whitaker and F. H. Glass. Some of these names appeared in the deal by which the Burgess plant was bought from the Crucible Steel Company and the others are supposed to be in the joint organization. The new company will start operating the plant in about a month, when all the improvemens will be made.

Reports from the importers' centers during the past 10 days show that inquiry for foreign billets has fallen off almost entirely, and that the market has been practically at a standstill. It is claimed that the withdrawal of the independents from those markets will end much of the inquiry for English and German product.

Gayley Laboratory Dedicated—The Gayley laboratory of chemistry and metallurgy, and the Oliver library, gifts to Lafayette college by James W. Gayley, vice president of the United States Steel corporation, and Henry W. Oliver, of Pittsburg, were dedicated April 6. The ceremony was performed by Mr. Gayley, the donor of the building, in the presence of his classmates of the class of 1874, followed by a prayer by his father, Rev. Samuel A. Gayley, D. D., who graduated there in 1847. The cost of the laboratory building, equipped and furnished, was $33,-000, which does not include the endowment of $5,000 to the Oliver library.

The First Year's Results.

The United States Steel Corporation's first fiscal year was completed March 31. The total net earnings as shown by the official reports were $11,067,195. This is larger than the capital stock of any of the other industrial companies. It is greater than the net earnings of the Pennsylvania, New York Central, New York, New Haven &Hartford, Louisville & Nashvillle and Central Railroad of New Jersey, five of the highest class dividend-paying railroads in the country.

The report shows that the estimates of earnings by the officers have been conservative. The complete statement of the first year's business of the company shows that after paying all dividends for the year there remains a surplus of $24,449,717. The monthly earnings were: April, 1901, $7,356,744; May, 1901, $9,612,349; June, 1901, $9,394,747; July, 1901, $9,580,151; August. 1901, $9,810,880; September, 1901, $9,272,-812; October, 1901, $12,205,774; November, 1901, $9,795,841; December, 1901, $7.258,298; January 1902, $8,901,016; February, 1902, $7,678,583; March 1902, (estimated.) $9,700,000: total net earnings, $111, 67,195.

The regular quarterly dividends at the rate of 7 per cent on the preferred and four per cent on the common stock were declared by the directors as usual.

The plan of the new bond issue was also thoroughly canvassed by the directors and approved by them. It will be put into the form of a circular and sent to the stockholders in a few days. A special meeting of the stockholders has been called for May 19 to act on the plan under the New Jersey law.

Judge Gary said that it was not compulsory upon the preferred stockholders, or any portion of them, to surrender their stock in exchange for the new bonds. It is said the company has enough subscriptions guaranteed to carry out its plan. The dividend on the preferred stock declared April 1 is payable May 15, the dividend on the common June 30.

The amount applied each month to "repairs, renewals and maintence of plants and interest on bonds and fixed charges of the subsidiary companies" was about 10 per cent. This is the first time the corporation has made an explicit statement on this point.

It is proposed to spend from $25,000,000 to $50,000,000 of the working capital in improving a number of subsidiary companies, which before the consolidation were in constant competition.

Chairman George W. Perkins and the other members of the finance committee of the United States Steel Corporation will meet in conference the heads of the constituent companies today. The conference is to determine how the $50,000,000 that is to be used for improvements and in harmonizing the various plants, shall be expended.

The needs of the various plants will be submitted to the finance committee, to President Charles M. Schwab and to Elbert H. Gary, chairman of the board of directors.

It is the intention of the corporation to spend at least $30,000,000 for immediate improvements and concentration of plants. The meeting may extend over several days.

President Schwab has informed a number of the Pittsburg members of the corporation that the improvements contemplated in the plants under the control of the corporation would be unusually large, and especially would this be the case in the Pittsburg district. The plans for the building of the tube works in Conneaut, O., have been fully decided upon.

It was also officially stated that the tube works would be strengthened by the building of new blast furnaces and that arrangements for the back haul of coke from the Connellsville fields to the new plant, over the Bessemer road have already been generally decided upon.

It was also said that the new tube plant would not in the least interfere with the existing plants in McKeesport, but that the older ones would be enlarged. It is said to have been found impracticable to make enlargement in McKeesport on a scale that was desired. President Schwab is of the opinion that the Conneaut site is the best that could be secured for the new works, and would enable a greater practice in economy in making tubes, and would also provide almost unlimited room for further expansions when they are necessary.

Negotiating for Coal Lands—Negotiations are pending for the sale of the Merchants' Coal Company's holdings and mines in Somerset county to the Berwind-White Coal Company. The sale means a transfer of about 18,000 acres of coal land. The Berwind-White Company already owns about 30,000 acres, which, with this proposed purchase, will give them 48,000 acres in the Northern part of the county. The Merchants' property lies near the Somerset & Cambria branch of the Baltimore & Ohio Railroad. A spur from Friedens, on the branch, to Boswell, 16 miles in length, to tap the Merchants' coal fields, is in course of construction and will be completed by August.

Fire damaged the bridge building and structural iron plant of Levering & Garrigues, Philadelphia a few days ago, to the extent of about $25,000. The loss is fully covered by insurance.

IN AND ABOUT PITTSBURG.

McCance Brothers Company, recently incorporated with $50.000 capital stock, will put in operation this week its new galvanzing plant at Sixty-second street and the Allegheny Valley Railway. The building is 110×60, feet to which a 50 foot addition is being built, and contains a 40-ton hot kettle and two cold tanks, a drying oven, and a No. 2 Bliss combined punch and shear. Another hot kettle will be installed in the new addition. The company has also erected adjoining its plant a 50 x 60 foot warehouse to carry a full line of merchant bars, hoops, bands, and black and galvanized sheets. The company is in the market for bolt cutting machinery.

The Pennsylvania Engineering Company, of New Castle, will at once make improvements and enlargements at its plant there, which will make it one of the largest concerns of the kind in the country. The contract has been let to the American Bridge Company, of Pittsburg, for the erection of a new boiler-making house, which will be 300 by 64 feet in dimensions in addition to the present great boiler houses. The Engineering Company recently increased its capital stock from $500,000 to $1,000,000 to provide funds for the improvements. The company has just been awarded a contract by the Tennessee Iron, Coal & Railway Company for building a large number of 60-ton steel ladle cars.

An application for a charter will be made April 25 by the Keystone Valve & Manufacturing Company, of Pittsburg, with $10.000 capital stock. The incorporators are: J. D. Riley, William A. Larimer, William H. McCulley, William J. Simpson, and Stephen McKay. The temporary offices of the company are at 2626 Carson street, South Side. A suitable building for the manufacture of valves and other articles is being sought for which will be equipped to have a capacity of 100 valves daily. A specialty will be made of a new steam valve, patented by Harry E. Keyes, of Homestead.

The annual meeting of the stockholders of the Bessemer & Lake Erie road took place at the general offices, Carnegie building, April 1. The directors chosen were: George E. McCague, E. H. Utley, E. H. Gary, Thomas Morrison, Robert A. Franks, T. H. Given, W. W. Blackburn, W.N. Frew, G. W. Keppler, J. T. Odell, D. M. Clemson, D. G. Kerr, Thosa H. Wells, James H. Reed. Mr. Gary and Mr. Keppler are new members. The board will meet this week and elect officers. There will be no changes in these which consist of President, J. H. Reed; vice-president J. H. Odell; secretary and treasurer, G. W. Keppler.

The United Engineering & Foundry Company, of Pittsburg, is shipping 20,000 tons of steel mill machinery to Monterey, Mexico, at present and this makes the first large shipment of this class of American material to that country. The shipment is for a new steel plant which is to be built in Monterey by a company composed almost exclusively of Mexicans and which will manufacture steel rails, structural material and steel plates. The machinery that is being made here is for a 44-inch blooming mill, with tables, approach tables, manipulators, rail straightening presses, cambering machines and roll lathes.

The Monarch Iron & Steel Company has been incorporated with $100,000 capital stock by Pittsburg, and Parkersburg, W. Va., men. The company is building a plant adjoining that of the Parkersburg Iron & Steel Company at Parkersburg, W. Va., to manufacture planished iron sheets under the patents of G. C. Broomall of Parkersburg, which is claimed to be equal to the Russian process. The officers of the company are: S. M. Nease, president; E. M. Whitto, secretary, of Pittsburg; G. Broomall, treasurer; and J. R. Rose, general manager, of Parkersburg. The plant will be in partial operation by May 1.

The plant of the Braddock Machine & Manufacturing Company at Braddock, recently purchased by the Carnegie Steel Company, is to be enlarged. Work was commenced on the improvements by George Hogg & Son, who have the contracts, Monday. The improvements will consist of a two-story office building 75x75, and a number of changes in the present machine shops of the company. The present offices are to be added to the machine shops, giving a considerable amount of additional floor space. Many other changes are contemplated and the roll making department is to be improved and enlarged.

The Pennsylvania Company may develop new coal mines along its New Castle branch. There are a number of important coal deposits North and South of this branch line in Lawrence and Mercer counties which can be reached by branch lines. The Bessemer has already managed to develop a large and remunerative business from the mines in Butler and Mercer counties. The New Castle branch of the Pennsylvania lines is to be greatly improved under Pennsylvania Company's jurisdiction.

The Westmoreland County Commissioners have awarded a contract to the Nelson & Buchanan Bridge Company, of this city, for the construction of a steel bridge over Big Sewickley

creek at Gratztown. The bridge, which will be 180 feet in length, with a single 16-foot driveway, will be five feet higher than the old covered wooden structure, which it supplants and which was wrecked by an ice gorge and flood several weeks ago.

The crucible furnaces of the Colonial Steel Company, at Colonia, were put in operation last week and the hammer department will be put on this week. Inclement weather has delayed work on the rolling mill to a considerable extent, but the company expects to have it in operation by the first of June. There is at present four smelting floors containing ninety-six pots, but the department will be enlarged by the addition of ninety-six additional pots this spring.

T. H. Tracy has placed an order with the Carnegie Company for sufficient flange steel plates to build a large copper smelting and converting plant at Bisbee, Ariz., to treat the ores of the Copper Queen mine. Mr. Tracy came from New York Sunday where he concluded the contract for the new plant with Phelps, Dodge & Company, owners of the mine. He is the mechanical engineer of the Mine & Smelter Supply Company, of El Paso, Tex., where the machinery will be made.

The Stanyon Engineering Company, of Pittsburg, was incorporated at Harrisburg last week with $5,000 capital. The new company is formed of the same interests which have conducted for some time the business of the Stanyon-Miller Engineering Company, at Fifth street and Liberty avenue, as a co-partnership. The new charter was secured through Arthur L. Over as solicitor, with Henry Stanyon, Thomas W. Fitch, Jr. and Gray E. Fitch as incorporators.

Officials of the American Tin Plate Company have been inspecting the abandoned mill property of the Hussey Steel Company, in New Kensington, with a view of adding it to the property already owned by the combine there. The company, it is said, proposes to increase the size of the Pennsylvania plant and the Pittsburg plant, both in New Kensington, in the near future, and will add several mills to these properties.

The Vulcan Crucible Steel Company is completing plans for a rolling mill and open-hearth furnace to be added to its plant at Alliquippa. The rolling mill contains a 15-inch train of rolls for roughing and a 10-inch train for finishing. The company is operating its melting furnaces to their capacity.

W. N. Humphrey & Brother, Brookville, Pa., will build a plant for the production of hollow blocks, conduit, sewer pipe, plain, paving and enameled brick and a general line of clay products. The firm has a number of gas wells on the property where the new plant will be located, together with a large supply of clay.

D. Lamond & Son, engineers and contractors, Ferguson block, have received an order from the Ashland Iron & Mining Company, Ashland, Ky., for remodeling the first of four Whitwell four-pass fire brick stoves. These will be raised to 75 feet high and re-lined as C. H. Foote patent two-pass stoves for which D. Lamond & Son are the sole agents.

The Robinson Machine Company, of Monongahela City, has located an office at 304 Frick building in charge of John A. Wood, Jr. The company is engaged in the manufacture of haulage and hoisting engines, exhaust fans, and mill castings. Plans are being prepared for an enlargement of the plant.

The Pittsburg White Metal Company is equipping the building at 160 LeRoy street, New York city, for the manufacture of Babbitt, linotype and stereotype metal. The company will continue its Pittsburg plant, on Liberty avenue, this city, and will care for the Eastern trade through its New York branch.

The Sharon Hoop Company has awarded a contract to the Columbia Bridge Company, of Carnegie, for the open-hearth steel plant that will be added to the present plant. The contract calls for two buildings each about 300 feet in length and 75 feet in width, and several smaller buildings for the engines and boilers.

The Westinghouse Electric & Manufacturing Company's works are closed for stock taking. Expert accountants of New York are working on the books of the company and this led to a renewal of the report of a merger with the General Electric Company. This was promptly denied by officials at Westinghouse headquarters.

The National Association of Blast Furnace Workers has notified the operators that they will attempt to enforce a working day of eight hours, the wages to remain as for the ruling 12 hour day, May 1.

The rail mill of the Edgar Thomson plant, Braddock, is under suspension for 10 days to allow repairs to be made. A new engine for the rail rolls and a number of other improvements are to be added.

The Reliable Manufacturing Company, of this city, applied for a charter April 3, for the purpose of manufacturing articles of iron and steel. The incorporators are Addison Boren, W. M. McJunkin and G. N. Chalfant, all of this city.

The Bakers' Machinery Company has leased the building at 3025 Liberty avenue, this city, which it will enlarge by adding a second story. The company will be in the market for machine tools.

NOTES OF THE INDUSTRIES.

The Thomas Furnace Company, Milwaukee. Wis., made its first cast a few days ago. A Brown hoisting apparatus removes the ore from the vessels into the yards. New blowing engines, boilers and a McClure stove have lately been added. The old stack was replaced with a 75 by 16 foot steel jacket. The personnel of the officers of the Thomas Furnace Company is: John M. Thomas. president; W. Aubrey Thomas, vice president; and T. E. Thomas, secreary. The furnace is in charge of E. C. Crowther as superintendent. The sales department is represented by J. F. Forsyth. The company expects to produce about 200 tons of foundry, malleable and Besssemer pig iron daily.

The Republic Iron & Steel Company intends to erect a blast furnace at Haselton, O., and will build a railroad for the purpose of conveying molten metal from the furnaces to the Bessemer steel plant. It is understood that the Republic company offiicals do not look with favor on the modern 600 and 800-ton stacks, which have not proven what the desigenrs expected of them, and that the new furnace will be a 300 or 400-ton stack, with modern appliances.

President A. W. Thompson, of the Republic Iron & Steel Company, states that his company is not in the consolidation business and that all stories about its going to be absorbed by the Steel Corporation were absurd. He says the corporation has enough on hand already and that the Republic company is not desirous of selling out. He added that the plants of the company in the South were in fine trim.

The plant, furnace, ore, mines and rights of the Valentine Iron Company was bought April 3 for $85,000 the by the Nittany Iron Company a new corporation composed of J. W. Gephart, L. T. Munson and Frank H. Clemson, of Bellefonte, and Archer Brown and William Sampson, of Rogers, Brown & Company. Men were put to work to get the plant ready for resumption June 1.

The Bethlehem Steel Company, South Bethlehem, Pa., last month shipped more armor plate than in any previous month in the history of the company. The output aggregated 997 tons, and included plates for United States battleships Maine and Ohio, and for the Russian batleship Emperor Alexander III, which is being constructed in Russia. The best previous month's record for shipment of armor was made in July, 1893, when the output, was 910 tons.

The new 26-inch billet mill of the Republic Iron & Steel Company, which was completed the past week, was started Monday under the supervision of P. J. Gordon, who will have charge of it. The mill was constructed under the direction of Samuel McDonald, and will add largely to the output of the company. A force of men is engaged in installing the machinery for the 40-inch blooming mill.

The King Bridge Company, Cleveland, O., held its regular annual meeting of stockholders last week and elected the following directors: James A. King, Charles A. Otis, Jr., H. W. King, Harley B. Gibbs, and H. W. Osborn. The directors organized as follows: James A. King, president; H. W. King, vice president; Harley B. Gibbs, treasurer; and Norman C. King, secretary.

The furnace operators of Alabama have pooled their forces and are importing negro labor to their mines and furnaces. In the past three weeks 1,200 have been imported from Tennessee and Georgia and there is not labor for all purposes. The importations are prorated.

The first section of the large new billet mill at the Bessemer plant of the Republic Iron & Steel Company, Youngstown, O., started last week and the result was altogether satisfactory.

Another steel wire company has been incorporated in New Jersey by Ohio interests, the Cuyahoga Wire & Fence Company, capital $125,000. The plant will be located near Cleveland, O.

The Interstate Clay & Mineral Company, of Philadelphia, will shortly begin the taking out of clay deposit on a 30-acre tract at Brandon, Berks county, Pa.

All the property and rights of the Standard Automatic Gas Engine Company, Oil City Pa., will be sold at a receiver's sale April 10.

The United States Steel Corporation has bought 5,000 tons of "Middlesbrough Foundry No. 3" for prompt shipment and about 100,000 tons of standard Bessemer for early delivery.

The United States Sewer Pipe Company of Pittsburg has made application for a charter to engage in the manufacture of sewer pipe, brick and tile. The incorporators are H. L. Castle, Frank Jarvis, and A. P. Meyer.

Charles E. Dixon & Son, 3027 Liberty avenue, this city, contemplate buying a 1,700-pound steam hammer and a light forging and upset machine.

The Mackintosh-Hemphill Company was awarded the contract for building the blooming mill of the Union Steel Company, at Donora.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—A period of quiet has been forced upon the market mainly because it is physically impossible to continue the former excessive excitement. There is less force to the congestion than formerly but there has been only a faint slackening in the urgency of the demand. Nevertheless there is less feverishness in every department of the markets than was the case a few weeks ago. The blast furnaces and steel finishing mills are operating more satisfactorily principally because the railroads are providing better transportation service. The piles of stock at the steel plants are slowly, very slowly, diminishing in size which means some assistance to the eager consumers. Buyers have settled down behind the conviction that the producers are accomplishing all that is possible and that only additional worry would result from a perpetual urging. The iron is ready and the finished steel is ready but the transportation end of the problem is still unready to act in unity with the producers. Still there has been a perceptible improvement in conditions which has been of advantage to both producers and consumers.

The sale of approximately 200,000 tons of standard Bessemer pig iron to the United States Steel Corporation companies by the Bessemer Furnace Association late last week seems to be the finger mark in the situation at present. There seems to have been an active spirit of self sacrifice in the furnace men's ranks as the price announced as covering the sale for delivery extending into 1903 seems a trifle cheap as compared to the ruling quotations on all other lines. Especially is this true when the effects of the strong demand running all through this year are considered duly. It would seem as if there could not fail to be higher prices next spring if nothing takes place to disturb with unusual violence the trade of 1902. The willingness of the blast furnace operators to dispose of their material now at much less than frantic consumers would gladly pay for it is a sign of cheerfulness that is not often witnessed under similar circumstances in iron and steel. In the finished lines there is nothing of feature presented. The mills are turning out stuff to the limit of capacity, or limit of available raw material, according to circumstances and the railroads are moving a portion of the product. The consumers are accepting their consignments with as much patience as they can command and that outlines the situation. While it is true that little new business is accepted there has been no slowing up in the number of offers made by consumers anxious to locate the first faint break in the rush for prompt shipments. The tightness still clings to rails and and structural, while plates and bars, sheets and tin plates, are less crowded but with indications that later in the season when there is additional output of the heavy products these lighter finished materials may suffer.

CURRENT QUOTATIONS:

Basic	$17 25		Splice bars	1 50	
Bessemer		18 25	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		17 50	Z beams	1 60	
Fdy 2, Nhn		17 25	Channels	1 60	
Fdy 3, Nhn		16 50	Boiler plates	1 75	
Mill Iron	18 00		Fire-box	1 85	
Fdy 1, Shn	17 25		Sheared	1 65	[illegible]
Fdy 2, Shn	16 90		Tank	1 69	[illegible]
Fdy 3, Shn	16 15		Steel melt'g scrap	18 50	[illegible]
Grey Forge, Shn	15 60		No. 1 wrought	20 00	[illegible]
Bessemer billets	31 50		No. 1 cast	17 00	[illegible]
Open hearth	32 00		Iron rails	25 00	[illegible]
Steel bars	1 50		Car wheels	18 00	[illegible]
Iron bars, refined		1 90	Cast borings	16 00	[illegible]
Light rails		37 00	Turnings	13 00	[illegible]
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—Quotations in the local pig iron market are somewhat erratic, but those who need material find difficulty in securing it at the figures mentioned by some concerns. Those who have iron and can make prompt deliveries name very full prices; those that are sold up and cannot make deliveries quote last week's or the previous week's prices, but that does not help buyers if they cannot get the iron. Most of the material coming forward is on old contracts, and cost probably from $2 to $5 per ton less than is being paid on new orders for deliveries during the second quarter of the year. Three is undoubtedly a serious shortage of pig iron, but it is expected that toward the end of the month the supply will be somewhat augmented, possibly not enough to affect prices but enough to relieve the immediate strain. The market for the standard brands of Northern iron at the present time may be quoted as follows: No. 1 foundry, $20 to $21 for shipment to July, and $19 to $20 for the last half of the year: No. 2 foundry, $19.25 to $20 and $17.50 to $18; gray forge, $18 to $18.25 and $17.25 to $17.50.

Steel billets for delivery during the next three months would command $32.50 to $33.50, but are still hard to get at even these figures.

The situation in finished iron and steel is about the same as it was a week ago, except that prices are a shade dearer, and the scarcity of some products is even more distinct than it was at that time. In all departments mills are pushed to their utmost to keep up with their orders, but in some cases they are getting further behind than ever, and others would if they ac-

cepted all the business that is put before them. Handsome premiums are being paid for early shipments.

There is no room for new steel rail orders before the end of the year. There have been reported recent transactions, but there is no verification. Standard sections are still quoted at $28 at mill.

CURRENT QUOTATIONS:

Foundry, 1	$19 00	21 00	Girder rails	32 00	32 50
Foundry, 2	17 55	20 00	Angles, 3" & lr'gr		1 80
Gray Forge	17 25	18 25	Under 3-inch		1 90
Bessemer billets		33 50	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown & Company—Of very necessity pig iron markets are quieter. The furnaces that are in position to take contracts or deliveries prior to October are too few to cut any figure. When it comes to deliveries the last quarter of the year, there is hesitation on the part of many buyers, who think increased output may bring prices down. There is, however, a considerable tonnage being booked for October, November and December, presumably to cover contracts for work taken by foundries and mills. In view of melters having quite generally contracted for their needs for the next six months, and the prospect of steady increase of output of pig, as transportation and other difficulties get straightened out, it is not generally believed that prices will go much, if any, higher. It is greatly to be desired that they should not, and the weight of influence of nearly all sellers is thrown against further advances. It is a singular but gratifying fact that throughout the entire period of scarcity of iron supplies, there has been apparently, a complete absence of speculation. At no time in the history of the trade have prices more genuinely reflected the law of supply and demand.

A number of important foundries are reported as closed down for lack of supplies of iron. However, if strikes in the fuel districts can be avoided, and railroads can supply cars, furnaces can soon help out those who are in trouble. The current month of April should show a decided increase in output as compared with February and March, when operations were crippled by floods and car famine.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$19 50	21 00	Angles	2 00	2 50
No. 2X fdy Jersey City	17 65	20 00	Tees	2 00	2 50
No. 2 plain Jer. C.	17 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	21 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	20 00		Com. base, bars per 100 lbs	1 65	1 70
No. 3 fdy N. Y.	19 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	17 00		Norway bars	3 75	

St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10		Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

Chicago—The supply of foundry pig iron is not improving; rather the reverse. There is only a small quantity of spot iron in the market and there is occasionally a needy melter who is willing to pay fancy prices for the same. No. 2 foundry has in isolated instances sold here very close to $20. There has been some closing down of foundries because of the scarcity. The large producers both local and Southern, are not actively in the market, confining their efforts to the filling of orders placed long since.

The great scarcity of scrap is influencing the price of iron bars, and open hearth product. The heavy purchases of old material during the past two months seems to have taken out of this territory a large tonnage of scrap which otherwise would have been consumed here. Prices of old material are uncertain, but the uncertainty is usually the extent to which values have advanced. There are some factors who think the top has been reached. Supply is no better.

Store trade in all the finished products of iron and steel continues quite as active as the sellers will permit. The latter are not seeking trade, the more conservative dealers restricting their business relations to old customers. Prices are strongly disposed but are generally held in check. The rush for steel bars is over but shipments from mill are not improving.

CURRENT QUOTATIONS:

Bessemer	19 50	20 00	Sheets, 26 store	3 25	3 30
Fdry Nohn 1	19 00	19 50	No. 27	3 35	3 40
Northern 2	18 50	19 00	No. 28	3 45	3 50
Northern 3	18 00	18 50	Angles	1 75	
Southern 1	18 15	19 15	Beams	1 75	
Southern 2	17 65	18 65	Tees	1 80	
Southern 3	17 15	18 15	Zees	1 75	
Forge	16 65	17 65	Channels	1 75	
Charcoal	21 00	22 00	Steel melt'g scrap	17 00	18 00
Billets, Bessemer	32 00	34 00	No. 1 r. r. wrought	20 00	21 00
Bars, iron	1 85	1 95	No. 1 cast, net ton	14 50	15 00
Bars, steel	1 75	1 80	Iron rails	25 00	26 00
Rails, standard	28 00		Car wheels	19 00	20 00
Rails, light	32 00	36 00	Cast borings	8 00	8 50
Plates, boiler	1 90	2 00	Turnings	13 00	14 00
Tank	1 75	1 80			

Cincinnati—The market for pig-iron has been peculiar and unsettled. Some of the larger Southern furnaces have repeated their claim that the inside prices herewith quoted, that is on a basis of $12 for No. 2 foundry, represent the market, but they have not offered to sell any

iron at the figures. The business of the week has been at the out-side prices given below, and when immediate deliveries have been required, consumers have very willingly paid $1 to $2 per ton more.

The railroads are in better shape and shipments are moving in a more satisfactory manner. The betterment in this respect is particularly noticeable in the South.

Demands for an eight hour day after May 1 by the blast furnace men is not causing alarm, as an agreement will probably be reached during the intervening month.

The movement of coke is ample, although the early opening of lake navigation may withdraw some of the transporting facilities, which can not well be spared. Buying has been notably active in bars for implement makers, and producers have sold their entire output so far ahead that new businss is not sought. Some contracts have been booked for the closing weeks of the year.

There is a decided scarcity of Southern charcoal iron, and offers of $19 cash, at furnace, have been refused because of inability to furnish it, as a number of furnaces have been obliged to bank. The heavy demand for basic has made it profitable for several of the Virginia furnaces to contract their output ahead on that grade, and the supply of foundry iron will be diminished proportionately.

The pressure on angles has been acute for some time past. Sheets appear to be getting scarcer every day, and it looks as though the mills would be unable to meet the demand except subject to considerable delay in deliveries. Steel bars are also very scarce, but iron bars and plates can be delivered almost as in ordinary times.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$16 75	Standard Sections	29 90	30 90
South fdy. 2	14 75	16 25	Sheet, 26	3 40	
South. fdy. 3	14 25	15 75	Sheets, 27	3 50	
South. fdy. 4	13 75	15 25	Sheets, 28	3 60	
Grey forge	13 75	15 00	Angles, 3 to 6 in	1 70	
Mottled	13 50	15 00	Angles, 1¼ to 2⅝	1 82	
Shn. 1, soft	15 25	16 75	Beams and Chanls		
Shn 2, soft	14 75	16 25	15 in and under	1 70	
L. Superior, fdy. 1	18 10	18 75	I b'ms 18, 20 24 in	1 80	
L. Superior, 2	17 60	18 25	Tees	1 75	
L. Sup'r char'l c w	21 00	22 00	Z's	1 70	
Hang'g r'k ccl, 1	22 50	23 00	1 wrought scrap	14 00	15 00
Sohn ccl c w	20 35	20 60	Steel mlting stock		
Jaksn cy. silv'y 1	18 35	18 60	gross ton	13 00	14 00
St'l brs base hlf ex	1 72		No. 1 cast	12 00	18 25
Iron bars	1 82		Old iron rails g t'n	18 50	19 50
Flange plates	1 80		Old car wheels	15 25	16 00
Tank steel	1 70		Cast borings	6 50	7 00
Ordinary fire-box	1 90		Turnings	7 00	7 75
Light rails	39 00				

Birmingham.—When asked if they were going to advance the price of pig iron, a number of Southern operators replied that they had booked orders for practically as much iron as they could make during the remainder of the year and that they could see no reason why an advance should be made. Shipments are becoming heavier owing to the rehabilitation of the railroads and the opening of the weather. Many of the coal mines still had water in them last Saturday. Many of them will have suffered an idleness of two weeks by reason of the recent visitation of rain. The foundries and machine shops are very busy, the Hardie-Tynes Machine & Foundry Company, among other items, building five 400-horsepower engines for the Buckeye Oil Company, of Cincinnati, for new cotton-seed oil mills at Macon and Augusta, Ga., Selma, Ala., Hot Springs, and Jackson, Miss., on which work has already commenced.

The steel industries at Ensley are in the strongest condition they have ever been, the rod mill especially. It is running on double turn. The Alabama Steel & Wire Company, its owners, promise considerable developments in the near future. Indeed their plans are very wide in their scope. The Republic Iron & Steel Company is busy in three directions, getting its new furnace into operation, building several hundred coke ovens at Thomas, and a new ore town in Blob county.

An interesting feature of the week was the report of the certainty of the entrance of the four large wholesale hardware firms of this city into the hardware combine now forming. It is stated positively that they have been bought out at about an aggregate price of $1,500,000. The general situation is as bouyant as could be.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 50	13 50	Tank	1 80	
No. 2 fdy, Sohn	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 50	12 00	No. 1 wrought	14 00	
Grey forge, Sohn	11 00	11 50	No. 1 cast	12 00	
Billets	23 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	3 10	3 50
Fire box	2 00				

Coal.

Pittsburg—The unpreparedness of the transportation companies has compelled the coal shippers to revise their original estimates of the movement of coal to the lake docks. The boats were ready for the early opening of navigation but the railroads were not and are not ready even now so that the full tide of coal shipments to lake points rests with the future. Not much coal is moving lakeward but the local supply has improved and is growing better weekly.

Cincinnati—The coal dealers called a meeting this week for the purpose of discussing ways and means for regulating some of the conditions that have crept into the trade which all of them are united in deprecating. There is complaint against the small dealers who have no elevator or yard, and sell at cut prices expecting to get their profit out of the hauling. The coalmen are discussing the advisabilty of making a higher price on coal in ton lots than on coal that is bought in two-ton lots or over. It is also recommended by some of the dealers that commission men be done away with altogether. Quotations are unchanged.

Chicago—The feeling of uncertainty respecting the future of railroad freight rates continues the most salient feature of the Western coal market. Beginning with the injunction against the Western roads issued by the United States court, against the cutting of rates, there has grown up both on Easterns and Western lines an uncertainty as to what the open coal tariffs will be. New rates have been in some instances publishe , but there are some indications that they may be modified. This is keeping back the closing of annual contracts. now due. Though the market is generally most liberally stocked with fuels there are exceptions, and some Western products are far inadequate to current wants. Coke continues scarce as a whole, more generous receipts from some producing regions not sufficing to fill the needs in the West. Consequently prices are very firm.

Cleveland—Some contract coal has been taken at 45 cents to Milwaukee, and there seems to have been enough of it to establish the season rate at that figure. The coal trade, however, has not been able to insist that the going rate shall be the same as the contract figure, and the owners are looking for better things in the open market. The chartering is comparatively light, either for contract cargoes or wild, because the season of coal shipping has not started fairly. The coal men do not seem to be ready to do business as yet, but it is expected that the first charters will be made in a comparatively short time. The coal boats will not be moving for a week or ten days yet, and even if they were now it is a question whether the cargoes could be supplied, since the coal has been coming forward somewhat slowly. The railroads did not expect such an early start of the boats, and the equipment has been diverted into other channels.

Coke.

Production in the Connellvsille field proper made a slight gain during the week but shipments dropped back almost 10,000 tons. The movement of fuel to Pittsburg showed an increase over the preceding week but the Western and Eastern points got less than the week before. The shipments, however, were sufficient to maintain a stock at the furnaces in the Pittsburg district and there was no complaint from the other sections. The loss in shipments was partially expected as the railroads rather over did themselves in the three previous weeks and established a fair stock of coke at the blast furnaces. The foundries are not so well supplied but there is nothing like a famine anywhere in the Pittsburg district. If the same ratio of production and shipments is maintained the blast furnaces and foundries will be able to pull through all right with perhaps here and there a shortage temporarily at some of the foundries until the warm weather arrives when movements will be more rapid.

The operations in the Masontown field made considerable improvement but not quite up to the record of two weeks ago. The advance over last week however, was a material one and assisted largely in keeping down the rush from the Connellsville region proper. Last week the Masontown field reported a loss of 147 cars or 3,822 tons in shipments; this week there is a gain of 103 cars, or 2,678 tons.

A summary of the Connellsville region for the week shows 20,535 ovens in blast and 757 idle.

The following figures show the scope of operations.

Production for the week	223,391 tons,
" last week	221,165 tons.
Increase	2,226 tons.
Shipments—	
To Pittsburg and river points	3,981 cars.
To points West of Pittsburg	5,250 cars.
To points East of Everson	1,936 cars.
Total	10,967 cars.
Last week	11,405 cars.
Shipments in tons for week	241,974 tons.
" " " last week	251,630 tons.
Decrease	9,656 tons.
Masontown Field	
Shipments for week	620 cars.
" last week	517 cars.
Increase	103 cars.
Shipments in tons	16,120 tons.
" last week	13,442 tons.
Increase	2,678 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

The Metal Markets.

LONDON—Tin—£123 10s—£116 10s Sales, 590 tons spot; 1,190 tons futures.

Copper—£53 17s 6d-£52 10s Sales, 900 tons spot; 1,800 tons futures.

Lead—£11 8s 9d-£11 7s 6d.

Spelter—£17 10s.

NEW YORK—Tin—$27.85—$26.00.

Copper—Lake.. 12¼; electrolytic, 12.25; casting 12½—12.00.

Lead—$4.15.

Spelter—$4.50-$4.37½.

ST. LOUIS—Lead—$3.97½.

Spelter—$4.25—$4.15.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including April 7, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	Shipments	Run
Transit	151,607	89,289
Tidewater	62,235	20,014
Southwest	9,348	53,929
Eureka	8,568	214,800
Buckeye, Macksburg oil	1,294	92,219
New York Transit	222,119	
Southern	144,788	....
Crescent	37,324	....
Total	636,283	470,278
Daily averages	106,114	78,751
LIMA.		
Buckeye / Indiana Local Division	246,244	1,543,832
Daily average	41,041	44,876

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
April 2	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
April 3	1.30	1.15	1.15	0.83	0.80	0.80
April 4	1.30	1.15	1.15	0.83	0.80	0.80
April 5	1.30	1.15	1.15	0.83	0.80	0.80
April 7	1.30	1.15	1.15	0.83	0.80	0.80
April 8	1.30	1.15	1.15	0.83	0.80	0.80

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Ninth Annual Report of the Committee on Atomic Weights F. W. Clark. (Jour. Am. Chem. Soc. Vol. XXIV. No. 3) Seventy-seven elements are reported, no new ones being added to the list. The report contains five columns. In the first two, H.=1, and in the others, O.=16; and include the determinations of Clark, Richards, (O.=16), and the results published by the German Chemical Society. The following atomic weights, not reported on last list, are given: Argon 39.6 and 39.96; Helium 3.93 and 3.96; Krypton; 81.15 and 81.76; Neon 19.8 and 19.94 and Xenon 127 and 128. Gladolinium is changed to 155.2 and 156.4 and Tellurium to 126.1 and 127.7; H.=1, is given first in the above figures. No other changes were discovered by the reviewer.

Thomas Boswell is president of the Merchants' Coal Company, and the stockholders are principally residents of Baltimore. With the transfer of this property the Berwind-White Company with 48,000 acres; J. J. and Oliver Hoblitzell, 26,000 acres, and the Consolidated Coal Company of Maryland, 30,000 acres, nearly all the valuable coal lands of Northern Somerset county will be confined to three holdings.

Aluminum Prices

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr. lb.	1000 lb. to ton lots.....34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb.
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum

Small lots.......35c. pr. lb.	1000 lb. to ton lots.....29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lots of 100 pounds, $1.10 per lb.; special price on large lots

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	9 to 15 [illegible]
Copper, light bottoms	[illegible]
Heavy Composition	9 to 10½ [illegible]
Brass Turnings	6½
Heavy Brass	7 to 7½ [illegible]
Light Brass	6.00
Heavy Lead	3.75
Tea Lead	3.50
Zinc Scrap	[illegible]
No. 1 Pewter	16

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 [illegible]
Bessemer Steel, 100 lbs	4 [illegible]
Bessemer Steel, 95 lbs	4 [illegible]
Bessemer Steel, 90 lbs	4 [illegible]
American Charcoal Terne—I. C., 14x20 ordinary	4 [illegible]
I. C., ordinary	9 [illegible]

American Coke, f. o. b. mill, quoted at $4.25 for full w[illegible] 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4.00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Besse[illegible] Steel, full weight, $4.90 Bessemer Steel, 100 lbs $4.7[illegible]

Accepted a Site.

As briefly announced in last week's issue, the Standard Steel Car Company has purchased 300 acres of ground at Butler as a site for the proposed new works at a cost of about $90,000. The company has begun the preparation of the site for the new works. These are expected to be completed and ready for operation by August 15. Part of the new site will be provided for the new rolled steel car wheel works that will be built by Charles T. Schoen, and for allied interests. It was definitely announced for the first time that the Harriman and friendly interests were back of the new car venture.

The properties secured include the Butler fair grounds and a portion of the Duffy estate. The sale was effected by George Brothers, of Pittsburg, through John S. Campbell, W. D. Brandon and J. H. Trautman, general manager of the Standard Plate Glass works, of Butler. The property is reached by the Pittsburg. Bessemer & Lake Erie railroad, Pittsburg & Western, West Penn, and Buffalo, Rochester & Pittsburg. President John M. Hansen visited Butler last week for the purpose of starting work on the laying switches for the company's terminal road.

President Hansen states that 100 acres of the plot will be used by the car works and that the remainder will be reserved for allied interests. He states that the building already under contract with the McClintic-Marshall Company will cover 50 acres and that the company has booked business which will require the entire output of the plant for four months. The capacity proposed is 50 cars a day. Contracts for the machinery were placed some time ago; that for the lathes, punches and presses being let to the Hilles & Mathes Company, of Wilmington, Del. These machines will be ready for installation by the time the buildings are complete. Electric power will be used throughout. It is believed that the water in Connoquenessing creek is sufficient for mill purposes. The first shipments of steel to the site will be made the last of this week.

Rapid Booking of Cranes.

Pawling & Harnischfeger, Milwaukee, Wis., advise that the demand for electric traveling cranes continues satisfactory in every way. They have recently booked orders for 45 cranes and hoists, among which are representative firms as follows:

Henry Vogt Machine Company, Louisville, Ky., one 5 ton, two 10 ton, one 15 ton; Oil Well Supply Company, Oil City, Pa, one 2 ton; Wheeling Steel & Iron Company, Wheeling, W. Va, one 7 ton; Allis-Chalmers Company, (Fraser & Chalmers plant) Chicago, one 20-ton, with 5 ton auilxiary; Allis-Chalmers Company, (Gates plant) Chicago, one 50-on with 5-ton auxiliary; Bradley Maufacturing Company, Allegheny, Pa., one 6-ton; Fairbanks, Morse & Company. Beloit, Wis., one 15-ton; Colorado Fuel & Iron Company, Bessemer, Colo., one 10-ton, one 20 ton; Whitney Iron Works Company, New Orleans, La., one 10 ton; one 20 ton; Newport News Shipbuilding & Dry Dock Company, Newport News, Va., two 20 ton; American Bridge Company, Philadelphia, one 20 ton, double trolley; Pittsburg Plate Glass Company, Pittsburg, two 3 ton; American Sheet Steel Company, W. Dewees Wood Company department, McKeesport, Pa., two 5-ton; Structural Steel Car Company, Canton, O., one 12-ton; The American Well Works, Aurora, Ill., one 10-ton; Norton Emery Wheel Company, Worcester, Mass., one 10 ton; Lackawanna Iron & Steel Company, West Seneca, N. Y., one 3-ton; Follansbee Brothers Company, Pittsburg, one 5-ton, one 10-ton, with 3 ton auxiliary, and one 25 ton; The Vulcan Works, Chester, Pa., one 15-ton, with one 5 ton auxiliary; Northern Central Railway, York, Pa., one 25-ton; The Midvale Steel Company, Philadelphia, Pa., one 10-ton jib; The Standard Steel Works, Burnham, Pa., five-2 ton and one 15-ton; American Sheet Steel Company, Wellsville works, Wellsville, O., one 30-ton with 55 ton auxiliary; The Trenton Iron Company, Trenton, N. J., one 3-ton; William B. Pollock & Company, Youngstown, O., one 20 ton riveter with 5 ton auxiliary.

Time the Main Question—A parliamentary paper issued at London, April, 2 gives correspondence respecting the comparative merits of the American, British and Belgian locomotives now in use in Egypt. In a dispatch to the foreign secretary, Lord Lansdowne, covering a number of reports received from railroad officials, the British diplomatic agent and consul general in Egypt, Lord Cromer, draws the general conclusion that the main reason why so many orders for railroad equipment have recently been given to the United States is that the American firms are able to execute them with extraordinary rapidity, due largely to the system of standardization

In respect to price Lord Cromer finds the British firms can hold their own where special designs have to be executed.

With respect to the quality of British work, it is at least equal, and often superior, to American and Belgian work, while in consumption of coal the British engines have a decided superiority over the American, though not over the Belgian engines.

The British manufacturer's weak point is delay in executing orders. The reports show that the American firms promised delivery within one-third of the time required by the British firms, while they offered to supply standard locomotives of equal suitability 10 per cent below the British price, though the latter's price for locomotives built on Egyptian specifications were lower than the American offers.

The correspondence includes the result of a series of trials of American and British freight and passenger engines, conducted by a representative of the Baldwin company and locomotive inspector of the Egyptian railroads, from which it appears that the American freight engines consumed 25.4 per cent more coal than the British, while the latter drew 14.2 per cent more load. With the same load the American passenger engine consumed 50 per cent more coal than the British engine.

Mr. Johnstone, president of the railroad board, concludes his report with a warning against the condemnation of American locomotives because these trials have been unsatisfactory, pointing out that the Egyptian engineers and firemen are not so muscular or intelligent as the Americans, and that alterations had to be made to enable them to operate the locomotives satisfactorily. He says he knows of railroads where a suitable American design has been selected and where the difference of coal consupmtion is very small.

Coating For Nails—John V. Brauch and Bernard Herman, of Belleville, Ill., have devised a coating to be applied to nails to protect them against the effects of moisture and the elements, and to serve as an aid to the retaining qualities of the nails by causing them to adhere more firmly to the body into which they are driven.

The coating is composed of a mixture of crude turpentine and linseed-oil. The percentage of each may vary according to conditions, but in practice the best results have been obtained by the following percentages: linseed oil, 40 per cent; crude turpentine, 40 per cent. Crude turpentine is the crude product of the pine, oil and spirits of turpentine being extracted therefrom, and by reason of its resinous properties is especially adapted to use as an adhesive element.

The coating is applied to the nails by immersing them. After the nails have been immersed they are placed in a drying-kiln. The nails are subjected to a heat high enough to thoroughly dry the coating. During the drying operation the action of the heat in the drying-kiln causes the composition of the coating to permeate the pores of the nails and cause the thin film of coating on the exterior to be firmly held, closing the pores against the moisture.

The coating is said to provide adhesive qualities by which the nails are caused to firmly adhere to the wood or other body into which they are driven by the friction produced in the act of driving.

Freezing of Moisture Deposited from Compressed Air—The presence of moisture in compressed air must be accepted as an unavoidable condition. Existing in the atmosphere at all times, in greater or less quantity, when air is compressed the moisture is carried with it.

In practice a part of the water is deposited in the air receiver; but a considerable quantity still remains, and will be brought into evidence when the proper conditions occur.

The capacity of air for moisture depends primarily upon its temperature. Under ordinary atmospheric conditions 1,000 cubic feet of air contain about one pound of water. When compressed in the compressor cylinder the increase of heat which takes place augments the moisture-carrying capacity of the air. But the moisture-carrying capacity is reduced by any subsequent decrease in temperature, and if the air be saturated the excess of moisture is deposited. Volume for volume the capacity of air for moisture is independent of its pressure or density. That is, at the same temerature, a cubic foot of air at atmospheric pressure will hold in suspension the same weight of water as a cubic foot at 100 pounds' pressure. But, this must not be misunderstood. If a certain volume of moist atmospheric air be compressed isothermally, that is, at constant temperature, say to one-tenth of its original volume, its water capacity is also reduced to one-tenth, and nine-tenths of the water originally present in the air is deposited. Therefore, while the water capacity of a given volume of air varies with the temperature, it must change also with any increase or decrease of the pressure which changes its volume.

Certain conditions are required to cause freezing; deposited moisture must be present, and it must be subjected to a temperature below the freezing point. So long as the temperature does not fall low enough the presence of moisture can do no harm. Although one of the recognized functions of the air receiver is to permit the deposition of water before the air passes into the pipes, still, unless the receiver be extremely large, the air leaves it warm—usually quite hot—and therefore carries with it considerable moisture.

Some time ago, at the Anaconda copper mines, Butte, Mont., a simple and inexpensive device

was installed to prevent the freezing of the moisture in a long line of surface piping. From one of the large compressor plants the air main was carried on the surface a long distance before reaching the shaft. During the winter months it was at times difficult to get sufficient air pressure in the mine, because of the partial choking up of the pipe. As the volume of air was too large to be dealt with by the ordinary receiver, a series of old boilers was put in close to the compressor house. The hot air, at 80 pounds' pressure, in passing through these boilers, from one to another, was cooled down practically to the temperature of the atmosphere, andas a consequence a large part of its moisture was deposited. It was found that old tubular boilers, when strong enough, are well suited to this purpose, because of the large surface presented to the cold outside air, especially when they are set horizontally, so that there is a free circulation of air through the tubes. A blower might be used for the same purpose, or the boilers submerged in cold water. This effectual remedy is well worthy of imitation where the conditions are similar—Prof. Robert Peele in Mines and Minerals, for April.

Nickel Plate Organization—At the organization meeting of the International Nickel Plate Company held April 1 at New York, the following officers were elected: President, Ambrose McConnell, who has been the assistant to the president of the Carnegie Company; chairman of the board of directors, Robert M. Thompson, president of the Orford Copper Company; secretary, Stephen H. P. Pell; treasurer, Joesph Claudet; board of directors. Mr. Thompson, Mr. Monnell, E. C. Converse, John R. De Lamar, Max Pam (general counsel), Joseph Wharton, Millard Hunsicker, Dr. Leslie D. Ward, and Archibald W. Maconochie, M. P.; executive committee, Mr. Thompson, Mr. Monnell, Mr. Converse, Mr. De Lamar and Mr. Pam.

It was voted to take over the entire capital stock of the following companies: The Orford Copper Company, the Canadian Copper Company, the Anglo-American Iron Company and the Verimillion Mining Company, which two are subsidiary to the Canadian Copper Company, but operated separately from it; the Nickel Corporation of London, the Societe Miniers Caledonenne, of New Caledonia, and the American Nickel Works of Camden.

Solvent Power of Phosphoric Acid—T. H. Byom (Jour. Soc. Chem. Ind. Vol. XXI, No.). The author. after mentioning the solubility of ferro silicon and spiegeleisen in strong phosphoric acid, recommends it as a solvent for chrome iron ores and ferro chromium alloys containing from 10 to 50 per cent chromium; 0.3 gram of the alloy or ore, finely crushed, may be treated with 6 c. c. of phosphoric acid syrup, sp. gr. 1.75, and heated to about 300 degrees C. for 15 minutes,) or longer for ore). When a beaker is used an insoluble white substance is sometimes formed. This may be prevented by the addition of 2 c. c. sulphuric acid. With platinum vessels this deposit is not produced. It is evidently silica obtained from the glass.

Oxidize the chromium by permanganate, titrate with standard ferrous sulphate and dichromate, and the results will be found to agree exactly with those done by the usual method depending on fusion or ignition and the conversion of chromium into chromate.

Cincinnati Notes.

President James McMahon of the Blast Furnace Workers of America, has sent the local organization an official notice from Youngstown O., that on and after, May 1, 1902, eight hours shall constitute a day's work, at the same rate of pay that they are now receiving for twelve hours' work. The notice will affect all the blast furnace workers of America, and instead of two shifts at a furnace each twenty-four hours, under the new scale three will be required.

The unions of the architectural iron workers, this city, submitted to their empolyers the new scale of wages which they want for the coming year. The scale provides for various grades of work, and the wages proposed by the new scale ranged from 16⅔ to 40 cents an hour. This is a slight increase on the rates which have prevailed the last year. A conference is in progress between the representatives of the employers and the men, and it is expected an amicable arrangment will be reached soon, and neither side is looking for a strike.

Bought Blacklick Coal—A Pittsburg syndicate has closed the purchase of 10,000 acres of coal land in Indiana county, which the purchasers will develop without delay. The deal was closed yesterday afternoon in the office of Captain W. H. McKinley, No. 1327 Park building. Capt. McKinley, who was a former operator on the Monongahela river, held the options on the property and John Exler, of Pittsburg, represented the purchasing syndicate as its head. The price consideration for the coal is $650,000. The first payment of $100,000 was made in closing the deal.

Patents.

The following patents granted April 7 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Mechanical stirrer and poker for slag producers, J. W. Dougherty, Steelton, Pa.; detachable boiler flue, J. F. Drake, Holly, Minn.; glass mold, W. J. Greenwood, Tarentum, assignor to C. L. Flaccus, Pittsburg; steam separator, W. L. Jameson, Denver; glass polishing machine, William Lahodny, Akron, O.; retort furnace, David Laird, Forfar, Scotland; glass working machine, F. R. McBerty, Evanston, Ill, assignor to Western Electric Company, Chicago; locomotive cylinder; John Player, Chicago, assignor to American Locomotive Company, New York, (2); apparatus for fire-finishing glassware, Henry Schaub, Mt. Pleasant, Pa., assignor to Bryce Brothers Company, same place; steam trap W. H. R & Thompson, London, England; gas or oil engine Elihu Thomson, Swampscott Mass.; internal combustion engine, Peter Burt, Hollybank, Scotland; rotary water tube boiler, A. S. Hughes, Mansfield, O.; exhast head. Henry Sims. Erie, Pa.; heating furnace, M. M. Suppes and Ralph Crooker, Jr., Elyria, O.; rotary engine. J. C. Walker. Waco, Texas; means for reducing condensation of steam in cylinders, G. R. Harvey, Pittsburg; automatic variable exhaust apparatus for locomotives, H. H. Huff, Boston; engine or motor, W. H. Barker, Leytonstone England; piston valve, William Heston, Homestead, Pa.; engine valve, J. G. McCormick, Cleveland; steam boiler, Franz Berger and H. M. Williams, Ft. Wayne. Ind.; balanced slide valve F. C. Charles, Cedar Rapids, Ia.; apparatus for refining and delivering glass, W. D. Keyes, Blairsville, Pa.; oil saver, rope clamp, and guide for oil well bump rods, C. F. Rigby, New Martinsviille, W. Va.(3); steam boiler, Alexander Spencer, London, England; apparatus for feeding and tempering foundry sand, A. M. Acklin, Pittsburg, rotary engine, I. V. Ketcham, Brooklyn N. Y.; steam bolier furnace, A. Peabody and N F. Johnson, London, England; combined steam and internal combustion motor, F. D. Clark McDonald, Pa.; compound steam turbine, F. H. Fullagar, Heaton, England, speed regulator for gas engines, H. H. Hennegin, Anderson, Ind assignor to Buckeye Manufacturing Company same place.

West Virginia Notes.

The new tube mill of the Wheeling Steel & Iron Company, at Benwood, will be making pipe by June. In some respects this will be one of the most interesting plants in the trade. Each machine will be propelled by an individual motor. The tools being made are of the latest high class patterns.

The syndicate that is presumed to be manipulating affairs for an extension of the West Virignia Central Railroad to the sea coast, has bought outright over 61,000 acres of mineral land in the territory through which the proposed extension will pass, most of it in the Alleghany and Shenandoah valleys in this state.

The operators of the New River district have forwarded a petition to the Chespeake & Ohio railroad asking for an improvement of shipping. The petition, it is understood, asserts that if the company does not provide better facilities the operators will take steps to retaliate.

A syndicate is arranging to pipe gas from Clarksburg, through a twelve-inch main, to the Pittsburg district. Rights of way for the line are being secured.

The National Glass Company will improve its Fairmont factory by the addition of three tempering furnaces and other items.

The Brier Mountain Coal Company, organized by Governor A. B. White and others, has opened headquarters at Parkersburg.

A factory 40x70 is being built at Fairmont for the Safety Hook & Check Company.

Pickands, Mather & Company, of Cleveland, are making contracts with various firms for the construction of parts of the blast furnace and ore dock that will be built at Toledo, O. A few contracts were let the latter part of the week, and more are to come. Work on furnace and power house will be done by the Variety Iron Works, of Cleveland, while the ore docks will be built by Brown & Ricket, of Duluth. The docks will have three legs, probably, and the furnace will have a productive capacity of about 400 tons a day.

The Harrisburg Rolling Mill Company, Harrisburg, Pa., has announced that April 16 the rate for puddling will be advanced 25 cents, making it $4.25 a ton, and 61 cents for heating. This is the highest wages paid in that city for heating and puddling for years.

The Philadelphia & Reading Railway Company will build new coal sheds at Harrisburg, Pa., which will be equipped with the latest type of machinery for handling coal.

The Canadian Power Company announces that its steel mill at Sault Ste. Marie will go into operation this week and will begin at once to roll rails at the rate of 500 tons a day. The company began to transport ore by water from its Canadian mines last week. The construction of a railroad line to these properties is being pushed forward as rapidly as possible.

Condition of the Blast Furnaces in the United States, April 1, 1902.

Compiled for the AMERICAN MANUFACTURER AND IRON WORLD.

LOCATION OF FURNACES.	CHARCOAL.					ANTHRACITE AND COKE.					BITUMINOUS AND COKE.				
		IN BLAST.		OUT OF B'ST			IN BLAST.		OUT OF B'ST			IN BLAST.		OUT BL'ST	
	Total No. Stacks.	No.	Weekly capac'y	No.	Weekly capac'y	Total No. Stacks.	No.	Weekly capac'y	No.	Weekly capac'y	Total No. Stacks.	No.	Weekly capac'y	No.	Weekly capac'y
Alabama	5	3	1,005	2	475						39	26	25,404	13	10,040
Colorado											3	3	4,483	0	0
Georgia	3	1	296	2	545						1	0	0	1	740
Illinois											19	19	36,695	0	0
Kentucky											8	5	2,337	3	1,405
Maryland	5	0	0	5	372						5	4	5,943	1	500
Virginia											21	16	10,455	5	2,827
Missouri	1	1	180	0	0						1	1	856	0	0
New England	7	8	294	4	360										
New Jersey						9	4	3,960	5	2,666					
Spiegel						3	3	524	0	0					
New York	3	2	638	1	75	7	2	1,232	5	2,798	10	4	6,206	6	3,580
North Carolina											2	0	0	2	463
Ohio—Eastern, Central and Northern											23	20	31,583	3	7,112
Hanging Rock District	7	1	50	6	477						12	11	6,019	1	300
Hocking Valley											3	2	903	1	350
Mahoning Valley											13	13	29,911	0	0
Oregon and Washington	2	1	100	1	280										
Pennsylvania general	8	2	85	6	506						6	5	6,095	1	1,150
Juniata and Conemaugh Valleys											15	9	13,331	6	2,553
Lebanon Valley						11	8	5,702	3	1,8[illegible]0					
Lehigh Valley						30	20	10,364	10	4,958					
Pittsburg district											34	32	78,101	2	2,600
Spiegel													2,324		
Schuylkill Valley						16	11	9,079	5	3,635					
Shenango Valley											18	15	23,821	3	4,19[illegible]
Susquehanna Valley, Upper						2	1	350	1	335					
Susquehanna Valley, Lower						11	7	5,938	4	1,350					
Tennessee	3	0	0	3	697						17	11	7,[illegible]34	6	3,670
Texas	4	1	165	3	725										
West Virginia											3	3	3,838	0	0
Wisconsin and Michigan	10	7	4,068	3	1,061										
Wisconsin and Minnesota											6	5	4,660	1	600
Total	58	22	7,201	35	5,573	89	56	37,149	33	17,552	259	204	305,053	55	42,430

Blast Furnaces April 1, 1902.

The following table gives the number and capacity of furnaces in and out of blast April 1, 1902:

Condition of Blast Furnaces in the United States April 1, 1902.

Fuel.	In Blast. No.	In Blast. Weekly Capacity.	Out of Blast. No.	Out of Blast. Weekly Capacity.
Charcoal	22	7,201	36	5,578
Anthracite and Coke	56	37,149	33	17,552
Bituminous and Coke	204	300,053	55	42,430
Total	282	344,403	124	65,555

Compared with March 1, the standing of the furnaces in blast was as follows:

Furnaces in Blast March 1, and April 1, 1902.

Fuel.	March 1. No.	March 1. Weekly Capacity.	April 1. No.	April 1. Weekly Capacity.
Charcoal	20	6,846	22	7,201
Anthracite and Coke	56	37,188	56	37,149
Bituminous and Coke	198	290,665	204	300,053
Total	274	334,699	282	344,403

The above comparison shows:
Increase in active charcoal furnaces, 2.
Increase in weekly capacity charcoal furnaces, 355 tons.
Increase in active anthracite and coke furnaces, 0.
Decrease in weekly cap. anth. and coke furn's, 39 tons.
Increase in active coke and bituminous furnaces, 6.
Increase in w'kly cap. bit. and coke furnaces 9,388 tons.
Net increase active furnaces, 8.
Net increase weekly capacity, 9,704 tons.

The following tables show the anthracite and coke and the bituminous and coke furnaces in blast in the various districts March 1 and April 1.

Anthracite and Coke Furnaces in Blast Mch. 1, and Apr. 1, 1902, by Districts.

District.	March 1. No.	March 1. Weekly Capacity.	April 1. No.	April 1. Weekly Capacity.
New Jersey	4	3,[illegible]60	4	3,960
Spiegel	3	519	3	524
New York	2	1,800	2	1,2[illegible]
Penna—Lebanon Valley	7	5,026	8	5,702
Lehigh Valley	21	11,132	20	10,364
Schuylkill Valley	11	9,221	11	9,079
Susquehanna Val. Upper	1	350	1	350
Susquehanna Val. Lower	7	6,[illegible]40	7	5,9[illegible]
Total	56	37,188	5[illegible]	37,149

Bituminous and Coke Furnaces in Blast Mch. 1, and Apr. 1, 1902, by Districts.

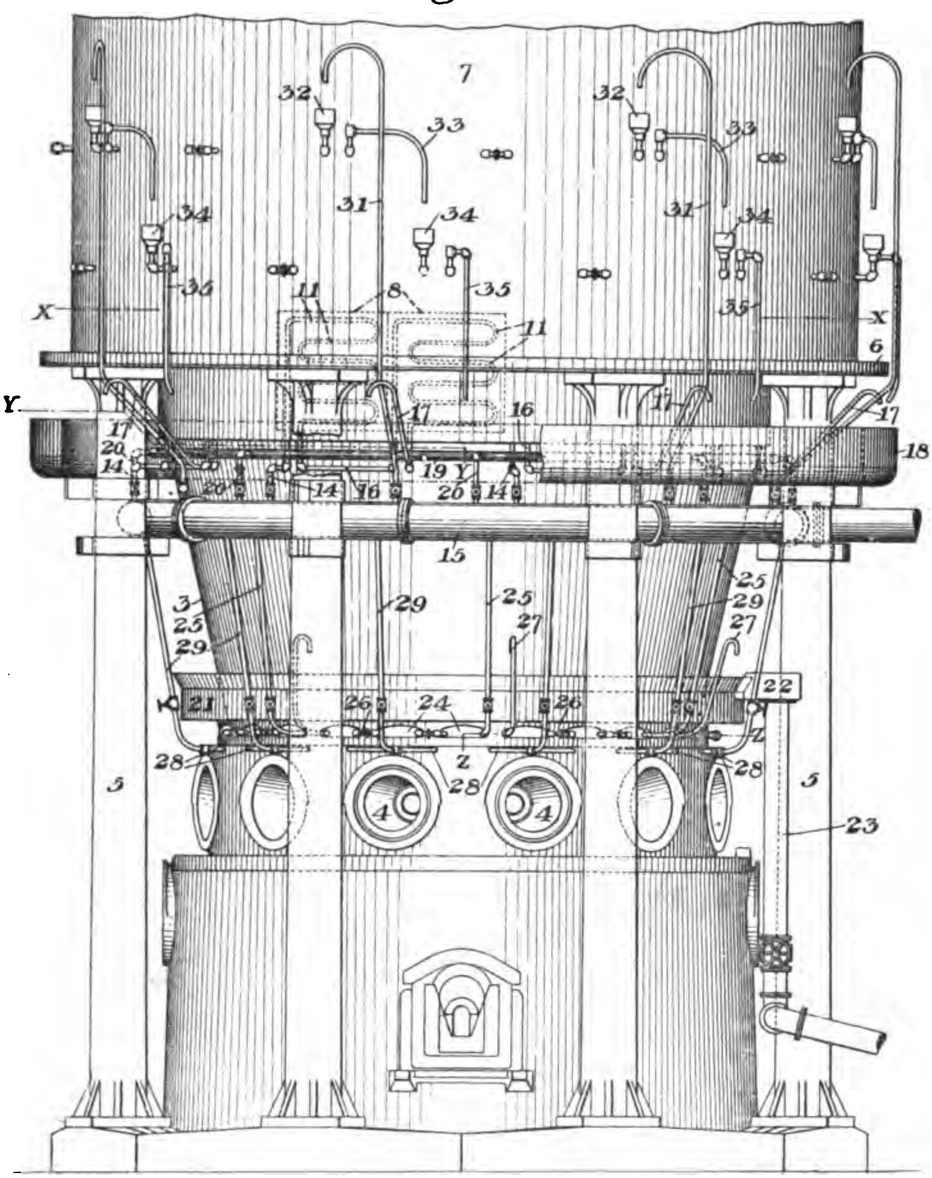
District.	March 1. No.	March 1. Weekly Capacity.	April 1. No.	April 1. Weekly Capacity
Alabama	27	26,247	26	25,404
Colorado	3	4,193	3	4,483
Georgia	0	0	0	0
Illinois	17	33,665	19	36,695
Kentucky	4	1,779	5	2,337
Maryland	4	5,600	4	5,943
Missouri	0	0	1	856
New York	4	5,825	4	6,206
North Carolina	0	0	0	0
Ohio—East'n, Cent. & Nth'n	19	30,794	20	31,583
Hanging Rock	10	6,003	11	6,019
Hocking Valley	2	80[illegible]	2	903
Mahoning Valley	12	29,128	13	29,911
Pennsylvania, general	5	5,673	5	6,095
Juniata & Conemaugh Val.	9	13,348	9	13,331
Pittsburg district	32	77,965	32	78,101
Spiegel		2,5[illegible]7		2,324
Shenango Valley	15	22,894	15	23,821
Tennessee	11	7,247	11	7,[illegible]34
Virginia	16	10,[illegible]09	16	10,455
West Virginia	3	3,850	3	3,838
Wisconsin & Minnesota	4	4,053	5	4,660
Total	198	290,665	204	300,053

THE RADER BLAST FURNACE.

THE illustrations presented give a clear conception of the essentials of the blast furnace construction recently patented by Charles I. Rader, of Youngstown.

Figure 1 is a partial vertical section of the furnace. Figure 2 is a side elevation, partially broken away; and Fig 3 is a horioznta1 section, the upper half of the

Fig. 2.



The Rader Blast Furnace.

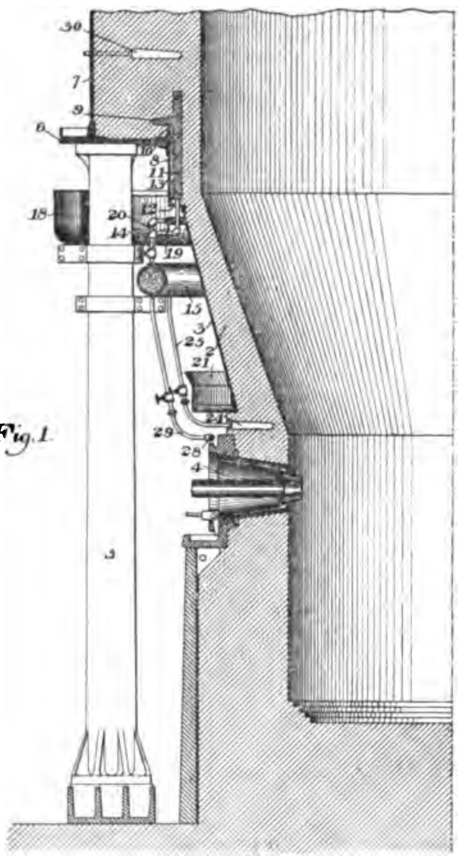
figure being on the line X X, the lower left-hand portion on the line Y Y, and the lower right-hand portion on the line ZZ of Fig. 2.

The invention relates to the construction of blast-furnaces particularly to the bosh portion; and is designed to prevent the formation of corrugations or ridges in

the bosh-lining, such as result from the use of the horizonal rows of cooling-plates now used. It is further designed to reduce the expense of constructing the bosh portion of the furnace, to prevent the forming of openings and forcing out of gases at the juncture of the jacket and the mantle, where a bosh-jacket is used, and to improve the action of the furnace and prolong its life.

In the drawings, 2 represents the bosh-lining, and 3 the bosh-jacket, of a blast furnace, having the usual tuyers 4. arranged around the crucible; 5 represents the supporting columns for the furnace, 6 the annular mantle plate, and 7 the cylindrical shell of the furnace.

Fig. 1.



The Rader Blast Furnace.

In order to prevent buckling of the bosh-jacket at the point where it joins the mantle, which cause openings through which the gases escape, there are provided vertically extending water-cooled plates 8, which extend from above the mantle-plate to a level below it and are provided with outer lateral flanges 9, which rest on angle 10, resting upon or secured to the mantle plate. These plates 8, may be water-cooled in any described manner, and they are shown as cast about serpentine pipes 11, both ends of which project downwardy through a jog or offset portion 12, in the bosh jacket.

A small space ,for rivetheads is shown between the outer face of the vertical plate 8, and the inner face of the cylindrical portion 13 of the bosh-jacket, which is preferably filled with grouting. The offset 12 is destined to protect this plate, so that the blast or gases, which arise with more or less velocity, are prevented from impact with the under side of the plate, which is set above the shelf or offset portion.

The water connections for the plates are shown connected in pairs. The supply pipe 14 leads from the annular supply pipe 15 and is connected to the serpentine pipe of one of the plates, while the outlet pipe 16 of this plate is connected with the inlet from the next plate. The outlet for this next plate of the pair is connected to a U-shaped pipe 17, which discharges into the annular trough 18, surrounding the bosh.

The jacket 3 is cooled by means of a circular spray-pipe 19, which surrounds it beneath the offset and discharges the water directly upon the jacket. This spray pipe may be led from the supply-pipe 15 through pipes 20. The lower end of the jacket is provided with a catch-trough 21, from which the water passes through overflow 22 (shown in Fig. 2) and through waste-pipe 23 to the sewer or well.

Between the lower part of the bosh-jacket and the tuyer-coolers are placed the horizontal cooling bosh plate 24. These plates are located in the wall and may be fed from the supply pipe through feed pipes 25. These plates are shown connected by the short pipes 26 in sets of three, the third plate having the waste-pipe 27, which is

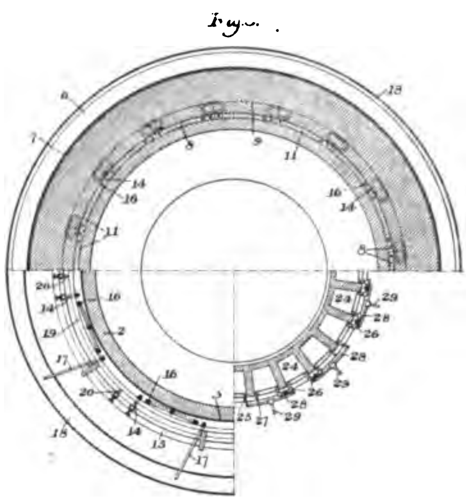
curved over to discharge into the trough 21. This row of plates is placed as closely above the tuyer coolers and below the lower end of the bosh-jacket as will allow their ready removal and prevent the impingement of the blast upon the bosh-jacket, and consequently prolong its life. They also act as a support for the brick lining or other refractory wall which may be formed or produced in the melting zone and prevent it from sliding into the hearth or crucibe.

The tuyer spray pipes 28 may be fed from the supply-pipes 15 through the feed-pipes 29.

In order to prevent recesses being formed in the lining above the plates 8, one or more horizontal rows of cooling plates 30 are provided above the mantle. The inner end of these plates 30 are preferably flush with the vertical plane of the inner faces of the plates 8, so that the cooling action holds the lining from recessing back of the plane of these plates.

In Fig. 2 is shown the water-supply connections for two rows of such plates, 31 being the feed-pipe leading from the supply and discharging into receptacles 32, connected to the in'et of one set of plates, through which the water is fed and from which it passes through pipe 33 to a receptacle 34, feeding a set of plates in the lower and from which the waste is led through pipe 35, which discharges into the trough 18.

The advantages claimed for the invention result from the use of the vertically-extending cooling plates at the juncture of the bosh and mantle in combination with the water-cooled bosh jacket, since the escape of the gases is prevented and the jacket is prevented from buckling. These vertical water-cooled plates thoroughly protect this level and are especially importantwith the low boshes now being universally adopted. The lowest parts of these plates are above the melting zone and are not liable to burn or melt while water is supplied. If from any cause any section of these plates should become useless, the spray on the jacket will prevent serious trouble. The shelf or offset portion of the bosh jacket assists in protecting this plate and places it outside the cutting action of the gases.



The Rader Blast Furnace.

The use of the sprayed bosh-jacket with the row of cooling-plates between it and the tuyers prevents ridges or corrugations forming in the bosh, the cooling-plates preventing the blast from injuring the jacket, and also supporting the lining. The water-cooled plates above the mantle prevent injury to the vertical mantle plates, and prevent recesses forming above the plates and insure a more even flow of the stock.

With this construction of bosh the stock is less liable to bridge, the working of the furnaace is more regular, and the cost of the bosh is much less than those of the ordinary construction.

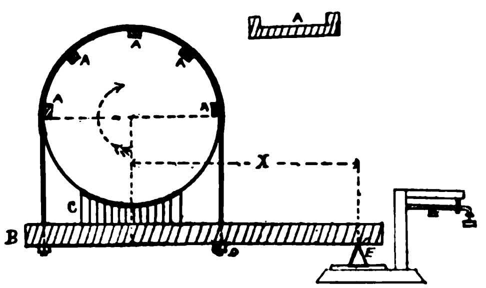
Many changes may be made in the form and arrangement of the jacket, the cooling plates, and the cooling connections without departing from the invention as defined in the claim.

HORSE POWER IN GAS ENGINES. II.

BY ALBERT STRITMATTER.

HAVING explained the conditions affecting the power of gas or gasoline engines, and why different sizes develop or may be rated at different powers, the question is natural-how is the horsepower of an engine determined? In answering, the difference between indicated and actual horsepower must be borne in mind.

The method commonly used is by the prony brake, of which there are a number of varieties. The accompanyng sketch shows one which is easily gotten up. Several blocks of wood "A" are attached to a piece of leather belting. These blocks are made U shaped to hold the belt on the pulley. One end of the belt is fastened to the beam "B" on which is a block "C". The other end of the belt is fastened to a bolt which extends through the beam "B" as shown. This bolt is threaded and a washer and nut "D"are placed on it. This is for the purpose of tightening the brake during the test. The beam "B" projects out from the pulley to a platform scale and rests on a knife-edged block "E". It is desirable that the beam be placed perfectly horziontal as the distance from the center of the crank shaft to the knife edge can be measured on the beam. If the test lasts for any length of time it will be necessary to have a stream of water play on the inside of the engine pulley, as it will get very hot from the friction.



In making a test of an engine for its maximum possible power it is necessary that the engine be in perfect adjustment, that the mixture of gas or gasoline and air be correct, and so on.

To make the test, start engine and gradually tighten the nut "D"untill the engine is carrying its maximum load and yet maintains the normal speed. In four cycle engines on full load the engine will take and explode a charge on every other revoluton of the crank shaft. In a two cycle engine it takes a change at every revolution. In the graduated charge or throttling type of four cycle engine, a charge may be taken at every other revolution of the crank shaft, but the charge may not be put to its full size. On full load, however, the full sized charge is taken.

When the engine is at full load, balance the scales and ascertain what weight is shown. Also be sure that you know what the speed of the engine is. Measure the diameter of the pulley, also the distance of "X' from the center of pulley or crank shaft to point of leverage on scales. Notice that this is not the distance from the center of shaft to point of leverage, but the horizontal distance between two vertical lines passing through the point of leverage and the center of crank.

There are several methods of figuring the horsepower. One of these is to multiply the diameter of the pulley (in feet) by 3.1416. Then multiply this product by the distance "X" (in feet) divided by the radius of the pulley (in feet). Multiply this product by the number of revolutions per minute of the pulley and mutliply the result by the net weight or pressure on the scale. Divide this product by 33,000 and the quotient is the brake horsepower.

Another method is to multiply the net pressure on the scales by the length of the brake arm "X" and the product by the number of revolutions per minute. Then multiply this product by .0001904. The result is the brake or actual horse power.

These two methods are really the same and. with any one set of figures will give the same result. They may be expressed algebraically as follows:

$$\frac{D\,N\,\frac{X}{R}\,N\,P}{33{,}000} = .0001904\ P \times N = B.\ H.\ P.$$

In these formulas D is the diameter of the pulley, the radius, P the net pressure on the scales, N, the number of revolutions per minute, and the length of the brake arm.

It will be noticed that the net pressure on the scales is to be used. This is not the pressure the scales actually shown but the weight shown less that exerted on the scale by the unbalanced portion of the brake and the weight of the knife edge. Prof. E. W. Roberts, in his "Gas Engine Handbook," gives the following method for ascertaining the net weight of the brake: When engine is still, let a man stand on the scale and weigh him. Then ascertain the weight shown when he takes hold of the brake near the knife edge and pulls upward with a slight friction on the pulley. Then find the weight when he pushes down on the brake. The pressure due to the unbalanced portion of the brake is the difference between the weight of the man and half the sum of the weights when pulling up and pushing down on the brake.

It will now be understood why actual horse power is sometimes called the brake horse power; i. e., it is the amount of power delivered at the brake, or the amount shown by the brake test.

Some engine manufacturers state in their catalogues that purchasers are invited to make a test of their engines at any time. Others say nothing about it. Of course there would be no objection on the part of any manufacturer who furnished engines up to the power at which he sold them, to a customer making a test provided it was made correcty. The trouble is that most tests when made by inexperienced operators are not correctly made and therefore result only in confusion and trouble. Few operators are able to determine whether their apparatus and methods are correct, and, further, the test is too frequently made when the engine is not in proper condition to develop its full power. It should be borne in mind that any test does not necessarily mean that the engine cannot develop more power, but only that it developed that much power at the time of the test, and any error made is more likely to be against than in favor of the engine.

Determination of Arsenic in Iron and Steel—George L. Norris, (Jour. Soc. Chem. Ind. Vol. XXI. No. 6). The author takes Dr. Olding's method for arsenic in copper, with the modifications described by Allen Gibb (see above Journal, 1901,184) and applies it to iron and steel.

The details of the method are as follows:—It being practically impossible to obtain ferric chloride and hydrochloric acid free from arsenic, it is necessary to purify these reagents before using. One hundred grams of ferric chloride (U. S. P.) are dissolved in 150 c. c. of strong hydrochloric acid, and 2 grams of pure powdered zinc added. When zinc is dissolved, the solution is boiled for 10 minutes, which is sufficient to free it of arsenic. The zinc serves two purposes—first to purify the reagents, and second, as zinc chloride, to raise the boiling point of the solution. A 500 c. c. Erlenmeyer flask is provided, fitted with a separatory funnel and an outlet tube, which dips into a beaker containing about 300 c. c. of cold distilled water. The outlet tube is arranged to trap or return to the flask most of the acid or chloride distilled over. Ten grams sample are weighed into the flask, and the ferric chloride solution described above is added. Connect up apparatus, heat gently until dissolved, then boil hard for about 15 minutes. The arsenious chloride is precipitated as sulphide as fast as it is distilled, either by means of a current of hydrogen sulphide passing into the beaker of water or by zinc sulphide placed in beaker before the test was started. The sulphide of arsenic may be weighed as such, or boiled with 400-500 c. c. of water, and, when dissolved, the resulting arsenious acid titrated with iodine. It may also be dissolved, precipitated as ammonium magnesium arsenate for final weighing as magnesium pyro-arsenate. Time required for solution and distillation is about one hour. The method has been used for over a year and results are found to be very accurate.

ALUMINIUM PROPERTIES AND REACTIONS.

From the French of M. J. Cavalier, Professor of Chemistry of the Faculty of Sciences of Marseilles, in the Revue de Chimie Industrielle.

THE industrial history of aluminum is of recent date. If the compounds of this metal are widely distributed in nature (alumina anhydrous or hydrated, clay, feldspar, etc.,) they are stable and are reduced with difficulty. In particular the oxide is not attackable by coal at the highest temperature of the ordinary industrial furnaces. It was Wohler, who, by the action of sodium on anhydrous aluminum chloride was able to prepare the metal in the state of a gray powder, and later to obtain some globules of metallic appearance.

It remained for Henri Sainte Claire Deville to render this reaction practical, to prepare aluminum in a large mass, to study its remarkable properties, and to predict for it numerous applications. But the Deville process, which had lowered the price of the kilogram of aluminum to 55 francs gave place to the electrolytic process, the only process now employed; the electrolysis of alumina kept in the melted state by the passage of the current itself.

The lowering of the price has been continued and has multiplied the industrial applications of the metal. At the same time the progress of the manufacture, impelled by the demands of consumption, has secured a much purer product. Ten years ago the commercial metal often contained 5 per cent of impurities (iron and silicium). Today the French factories of Froges and of Saint-Michel deliver a metal of 99.5 per cent.

It was natural that the attention of chemists should again be directed to the study of the properties of aluminum. These have of late been the object of numerous researches, with results of the highest interest which we propose to view briefly.

Deville had been struck by the remarkable properties of aluminum; its very great lightness, malleability, mechanical resistance, electrical conductibility, harmlessness of its compounds, and especially its great chemical resistance to the principal agents, in particular its unchangeability in the air and in presence of saline solutions except chlorhydric acid and the alkalies.

This unchangeableness appears, however, in contradiction with the great stability of the compounds. For example, the inoxidability of aluminum is not in accord with the difficulty of the reduction of its oxide. The anomaly appears more distinctly by comparison of the numbers indicating the disengagement of heat produced in the combination of the principal elements with oxygen. I will cite some of these, referring to the same quantity of oxygen, one atom.

		Calories.			Calories.
Magnesium	MgO	145.5	Iron	$\frac{1}{3}Fe^{3}O^{4}$	65.9
Calcium	CaO	145.0	Hydrogen	$H^{2}O$ (gas)	58.1
Aluminum	$\frac{1}{3}Al^{2}O^{3}$	131.2	Lead	PbO	50.8
Sodium	$Na^{2}O$	100.9	Copper	$Cu^{2}O$	43.8
Silicium	$\frac{1}{2}SiO^{2}$	90.9	Mercury	HgO	21.5
Manganese	MnO	90.0	Silver	$Ag^{2}O$	7.0
Zinc	ZnO	84.8			

In this table aluminum appears between calcium and sodium, both metals endowed with great chemical activity.

In fact, recent experiments have shown that the conclusions of Deville on the unchangeableness of aluminum are neither general nor absolute. On the contrary, circumstances occur, in which this metal possesses remarkable chemical activity and gives rise to very energetic reactions.

In many cases, aluminum does not react because it is not in intimate contact with substances in presence. Thus, when it is heated in the air, it does not burn and appears not to be oxidized. In reality, there is a superficial attack, and the metal is rapidly covered with a thin coating of alumina, forming a protection and preventing all further attack. The attack will be rendered possible by breaking the

coating or by mutiplying the surfaces in contact; that is to say, by employing the metal in a very divided state, as grains, impalpable powder (bronze). In this form aluminum may give rise to very intense reactions.

It is, therefore, very important, in the consideration of the chemical properties of aluminum, to take account of its physical state, to distinguish the very finely divided metal, easily attackable, from the compact metal, in sheets or ingots.

But, even in the later form, the metal is a little more readily attackable than would have been at first supposed, by acids or saline solutions. The action of these reagents is of great importance in certain employments. These have been recently studied thoroughly. I will refer to the principal reactions, and then point out the principal properties of divided aluminum and the very curious applications resulting from them.

Chlorhydric acid alone causes a lively reaction, with abundant disengagement of hydrogen. With other acids, cold, the attack is null or very feeble.

Dilute sulphuric acid (about 3 per cent) appears absolutely without action on a sheet of aluminum, but at the end of a few days small bubbles of gas are detached from the sharp edges; the metal changes in appearance, loses its polish; hydrogen, which is less adherent, is disengaged quickly; and the metal is gradually dissolved.

The same phenomena are produced very readily if the operation is in vacuum, which facilitates the disengagement of the gaseous bubbles, or if it is carried to ebullition.

M. Ditte concludes that the attack on the metal has taken place from the outset, but the resulting hydrogen forms an impermeable gaseous coating the more adherent in proportion as the polish of the metal is the greater, preventing mechanically the contact of the two reacting surfaces.

Aluminum behaves like amalgamated zinc or pure zinc. Dilute sulphuric acid attacks it very strongly if a small quantity of certain metallic chlorides is added, such as those of gold, platinum, mercury, and copper, which are reduced by aluminum. This is at first covered with a coating of pulverulent metal, and is afterwards dissolved, with an abundant disengagement of hydrogen.

The other dilute acids, such as nitric acid and the organic acids (acetic, oxalic, tartaric, citric, etc.) occasion similar phenomena. At first, nothing is apparent; then after a few days, the sheet changes in appearance, becomes dull, and is dissolved more or less quickly, according to the nature of the acid. The gaseous disengagement is facilitated and the attack hastened by operating either in vacuo or at boiling point, especially by adding platinum chloride.

Nitric acid does not afford disengagement of hydrogen, but much nitric oxide and nitrogen; there is also formed ammonia, as in the case of zinc.

Aluminum is attacked, cold, by solutions of potash and soda, with disengagement of hydrogen, and formation of soluble aluminates.

That of potassium has been obtained by Frenny in beautiful, clear crystals, of the formula Al^2O^3 K^2O, $3H^2O$. This potassium aluminate is soluble in cold water, which decomposes it partially. The solution is always clouded with separated alumina. At the same time potassa is set at liberty until the equilibrium corresponding to the temperature has been reached. If it is then filtered, a clear liquid is obtained, which is soon clouded anew and yields a deposit of crystalized alumina. This deposit increases, and the decomposition continues for several days. It is the more rapid if the solution is shaken, as this is the more concentrated, and finally becomes nearly complete.

The same phenomena will result by making a liquid more simply. To a dilute solution of an aluminum salt, potash is added so as to redissolve incompletely the gelatinous alumina. It is filtered, and the liquid is left in a closed vessel.

If, on the contrary, the solution is complete, the liquid will contain a small excess of potassa, and if the temperature and concentration remain the same, there will be no decomposition. The liquid preserved in a close vessel for several months does not deposit alumina.

These phenomena may be regarded as follows: The gelatinous alumina is very

soluble in potash. On the contrary, the crystallized alumina is very slightly so. If, therefore, we consider a solution in equilibrium as in contact with gelatinous alumina (its composition corresponds to potassium aluminate with a slight excess of potassa) this solution is supersaturated with reference to the crystallized alumina and will remain so in the absence of any crystallized alumina. But if by any process a particle of crystallized alumina is produced at a point of the liquid, this supersaturation will cease more or less slowly; almost the whole of the alumina being deposited in a crystallized state. There will remain in the solution only the quantity corresponding to the equilibrium. The production of the initial crystal is easy. If the solution of aluminate is exactly in equilbrium for a given temperature, the least variation of temperature will change the conditions of equilibrium and may cause spontaneously the precipitation of the alumina. If, on the contrary, the solution contains an excess of alkali, even slight, it will be necessary to determine the appearance of the first crystal by means, for example, of a few bubbles of carbonic gas; often the quantity contained in the air will suffice.

If I have dwelt at length on these phenomena, it is because they have an important industrial application in the preparation of pure alumina necessary for the production of aluminum.

It is known that natural bauxite is converted into sodium aluminate, of which the solution is precipitated by carbonic gas. In general, today, a quantity of carbonic gas much inferior to that which is necessary for a total precipitation, is made use of and shaken energetically. On contact of the first crystals formed, and by means of the preceding mechanism almost the whole of the alumina is deposited in a crystallized state, and in much greater purity than by the old process.

Aluminum separates at once gold, platinum, mercury, etc., from their chlorides, but appears without action on most of the other metallic salts. In reality, it reacts on solutions of zinc, copper, iron, etc., very slowly, and the attack presents the characteristics as in the case of dilute acids; it is promoted by the addition of a little chloride easily decomposable (platinum.) The metal of the solution is deposited on the aluminum, principally at projecting points, and at the same time hydrogen is disengaged in consequence of the formation of a basic sulphate of alumina.

The alkaline chlorides, sea-salt for instance, are without action if they are pure. They react slowly, but decidedly, after the addition of a small quantity of an acid, even a weak acid, such as acetic, tartaric, or oxalic. They react also on contact with the atmosphere; oxygen and carbonic acid then intervene. A sheet of aluminum, partially immersed in salted water, changes near the surface when the metal is in contact both with the solution and with the air. It becomes covered at length with flakes of gelatinous alumina, crystallizing gradually. The attack continues principally at the points of the attack, the sheet is drawn from the solution, and the water allowed to evaporate. After complete drying, the whole reaction is arrested. But if the active liquid, instead of being pure salted water, containg very hydroscopic substances; if, for instance, it is sea-water, the coating of alumina already formed will remain moist and spongy, and will allow the continuation of the cycle of reactions, of which the result is the conversion of the metal into an oxide.

Thus, when aluminum has been in contact with salt water and an attack has commenced, if it is not afterwards completly freed, by suitable washing, of every trace of alumina and of alkali, the attack will continue at the exposed points; the aluminum will be "malade" (diseased).

The attack of aluminum by the different agents in question is the easier as the metal is less pure. This is an important point, particularly insisted on by M. Moissan. Impure aluminum is always punctured more rapidly than the pure metal.

At present, the metal in the trade contains more sodium than at the commencement of the manufacture; this renders it changeable. The contact of a different metal, or merely an alloy of different composition, facilitates the attack, in consequence of the production of contact of electro-motive forces. If in certain parts of an object, as bolts, rivets, nails, a different metal or alloy is employed, the changes a ways commence at the points of contact.

From the facts previously stated it follows that aluminum in sheets is more

changeable than Deville believed. Dilute acids, even when weak, saline solution with or without contact with the air, may at length produce material alterations.

It is important in practice to take these into account, and in each case to study thoroughly the circumstances suitable for the metal.

In particular, for the manufacture of articles designed to contain alimentary substances, liquids more or less acid, (as kitchen utensils, military equipments, etc.) it will be necessary to avoid sharp angles, rivets, folded portions, to allow of thorough cleaning and the removal of every exposed point of attack, and to discard the use of alloys of different composition. In these conditions, aluminum will be quite resistive and will possess greater advantages than tin and other metals, such as its lightness, the harmlessness of its salts, the facility with which it can be worked by stamping, producing articles without soldering.

Under the circumstances which have been stated the changes in compact aluminum are always quite slow. By modifying the state of the metal, it has been possible to obtain more energetic reactions, which have led to important applications not in the least anticipated a few years ago.

Exports Not Considered—Frank H. Mason, United States consul at Berlin, writes his department under recent date:

A German merchant who had spent three months in the United States seeking to form connections for the export of coal and other staple products to Europe returned early in January unsuccessful and discouraged. In relating his experiences and the causes of his failure, he said:

The simple fact is that the American mine owners and manufacturers are so busy supplying the home demand that they have no surplus to export nor any time to talk about foreign trade. If I went to the office of a business man, I found him working at white heat; and if I stayed longer than three minutes, I could detect him glancing stealthily at the clock and impatiently wondering when I would go. I went the rounds of the companies who mine and handle the block coals of Western Pennsylvania and Virginia, which of all American bituminous grades are the best adapted for export, and found that there was not a carload to be had at any price that would permit it to be exported. None of these companies could fully supply their American trade—all were more or less behind their orders—and complained that life had been made a burden by the lack of cars and the inability of the railroads to handle their freight. So, too, in iron and steel. I found no one with any to sell, but several parties who would gladly buy European structural steel, billets, and rails, provided the latter could be furnished in American sizes and profiles and delivered promptly. I tried to interest them about the German tariff and reciprocity, but I found that they were too busy to talk, and knew or cared no more about the German tariff legislation than they did about the next proclamation by the Akhoond of Swat. We used to feel and act that way in Germany two or three years ago, and so I gave up the attempt to do business over there and came home to wait until the home market pressure subsides a little and some of those brave, busy fellows will be hunting around for a foreign market into which to dump their surplus products."

The situation depicted in the foregoing interview has continued throughout the winter, and the American home market, so far from weakening, has grown so insistent and all absorbing that the tide has turned Westward, and not only pig iron, but steel billets bars, and rails—notably the special kinds for street and suburban electric railways—are now being imported from Great Britain, Belgium, and Germany into the United States. One reads in the German newspapers of orders aggregating 150,000 tons of "Halebzeug," or partially manufactured steel, being placed in this country, with the effect of reviving prices and quickening the sluggish lifeblood of the Rhenish metal industries. The steel works at Differdingen have started up two additional blast furnaces and their new rolling mill to work out their share of the American orders. Under such conditions, there is naturally no question at present of any important export of bituminous coal, much less of iron and steel, from our country to Germany, and it may be of interest to look over the field and consider what, if anything except raw materials and food products, German importers at present need or will buy from the United States.

RECENT TRADE INVENTIONS.

A PROCESS of manufacturing iron and iron alloys has been devised by Francis C. Crean, of Montreal, Canada, who has obtained a patent in this country.

It has for its primary object to utilize loose granular magnetite, or what is known as "black sand," for the manufacture of cast iron, steel, nickel steel. and any alloy including iron the component parts of which have an affinity for iron. An ordinary foundry ladle or crucible is charged with the molten metal be mixed with the black sand, which has first been cleaned of silica, titanium, and other foreign substance the proportion of cleansed sand varying according to the grade of hardness required in the product.

As an example, the specific method may be described of producing an iron having a breaking strength of 78,400 pounds in bars of 12 inches length and 2.99 inches by 2.93 inches cross-section.

In the production of these bars a foundry ladle is charged with molten pig iron, 66 per cent., to which is added. immediately the pig-iron is poured from the furnace, 34 per cent of clean loose granular magnetite or black sand at its natural temperature. This mixture is stirred a few times, and the iron is complete. A test of this iron and of iron with different proportions of pig iron and magnetite in bars of different dimensions gave the followin results:

Composition		Bars.		
Molten pig-iron. Per cent.	Magnetite. Per cent	Length. Inches.	Cross-section. Inches.	Breaking strength. Pounds.
84	16	12	3.02x2.98	68,000
80	20	12	3.01x2.98	73,800
76	24	12	3.00x2.98	75,600
66	34	12	2.99x2.93	78,400

The inventor found a difficulty in treating large quantities and in alloying the iron particles of loose granlar magnetite and a metal having an affinity for iron, in causing the molten metal and loose granular magnetite to mingle. The molten metal, if the magnetite were placed in the crucible first, would run over the top of and combine with only a small proportion of the magnetite, and the same would be the case if the molten metal were first poured into the crucible and the loose magnetite poured on top of it. To obviate this difficutly and cause the molten metal and loose granular magnetite to mingle thoroughly and combine with one another, a predetermined quantity of the loose granular magnetite is supplied through a tube to a predetermined quantity of the molten metal in the crucible, the tube being gradually raised from the bottom through the mass of metal in the crucible while the magnetite is being fed through, thereby causing the magnetite to be thoroughly distributed throughout the metal in the crucible, or, if desired, the molten metal can in a similar manner be fed through the tube into and distributed through a body of loose magnetite in the crucible.

A Late Melting Process—Guilliam H. Clamer, of Philadelphia, has obtained a patent on a method to produce a metal in a state of substantial purity from its ores and from alloys in combination with a metal or metals more electropositive. The alloy or admixture is heated in contact with the ore, which may be oxide, sulphide or chloride, of the same kind of metal as the basic metal of the alloy whereby the electropositive metal or metals of the alloy unite or unites with the substance which was in combinaion with the metal of the ore, setting the metal free from the ore and from the alloy in a substantially pure state.

In the production of steel, the materials employed are iron ore, such as magnetite and silicide of iron. In this instance iron is the basic and silicon the electropositive metal. Upon heating and fluxing, the silicon appropriates the oxygen of the ore or magnetite, setting free metallic iron, which unites with the iron, the base of the silicide. The oxide of silicon is taken up by the flux, and the iron derived both from the alloy and the ore remains in a practical state of purity. In the production of low-carbon iron or steel it is advantageous to employ the high-grade ferrosilicons. By suitably selecting the ferro-silicons it is possible to

produce a low-carbon iron adapted to make homogeneous castings free from honey combing or formation of blow-holes.

The method presents an advantage in that the initial temperature required to bring out the reaction is very much lower than for melting steel for the same purpose for several reasons—first, because the ferrosilicon melts at comparatively low temperature: second, because the reaction of the silicon with the ore mixture is accompanied by liberation of a great amount of heat. The heat liberated is sufficient to get the product in such a thin fluid condition as will permit of pouring into molds without incurring the risk of chilling or thickening in the operation, and chilling or thickening is a common experience in the manufacture of such castings by known methods.

In practice, an iron silicide or ferrosilicon of suitable composition is selected for the purpose, and melted in the presence of the needful proportion of iron and oxide as magnetite for satisfying the chemical affinity of the silicon. A slight excess of the iron oxide is advantageous to insure complete oxidation and removal of the silicon as silica and its incorporation with the slag. A suitable flux is employed in the operation. The ferrosilicon may either be fused and the oxide added to the fused alloy or the ferrosilicon and oxid may be initially charged in a crucible or furnace, as may be most convenient. By a proper selection of the ferrosilicon and its admixture with the proper quantity of iron oxide a finished product of low-carbon iron or steel may be made in a single operation. Where, as will frequently be the case, the iron silicide or ferrrosilicon contains a percentage of carbon exceeding that which would be permissible in the product of the reaction, the difficulty is obviated by melting in the ferrosilicon a quantity of wrought-iron or steel scrap to reduce the carbon percentage to the permissible limit. The product obtained after the completed reaction of the silicon with ore will then have the proper carbon prercentage to yield a metal of the desired quality. It is true that a certain percentage of the carbon is oxidized by reaction with the oxide of iron, but not sufficiently in most cases to produce a soft grade of metal where the original content is high.

By analogy the substitution for the silicide of iron and iron ore of the silicide of another metal, as nickel, and an oxide of that metal, as nickel oxide, would result in the production of that metal or nickel.

Combinations and Lake Iron Mining.

IN regard to the industrial consolidations which have been made during the past three years, the mineral commissioner of Michigan, Mr. Russell, says in his report for the year: "The process of consolidation which was begun some years ago, and which reached an acute stage in 1899 and 1900, has finally arrived at a point where the greater number of the best mines of all five ranges have been consolidated in the hands of the United States Steel Corporation. A few of the independent mines remain in active operation, and these may be divided into two classes—the small properties, of comparatively trifling or doubtful value, practically all of which can be secured by the United States Steel Corporation, whenever desired, by the payment of the fair prices, and a second class comprising a very few mining companies of the first rank, such as the Cleveland Cliffs, Lake Angeline, and several others. In the case of the large mines which yet remain outside of the all-embracing grasp of the United Sttes Steel Corporation. it is eminently a case of survival of the fittest. The lines that remain independent producers on a considerable scale are without exception properties that in addition to possessing large and valuable ore bodies have been managed with great skill and prudence. The shortsighted concerns are out of business and what were once their mines are now in the hands of the 'trust.' The far-seeing people who were not satisfied to remain in a rut, but planned and acted for the future are the ones who remain in the business, and in their case they have little to fear from the gigantic corporation that so effectualy dominates the iron and steel industry.

"The advent of the great steel corporation into a field where it is obvious that there will remain room for only the sturdiest or smallest of independent competitors,

has naturally been regarded with feelings of consternation by the great majority of operators outside of the fold. It is realized, however, that the development of such a colossus is merely the natural outcome of the trend of industrial evolution, and that nothing will be gained by grumbling or endeavoring to resist the logic of events.

"The sentiments with which the United States Steel Corporation are regarded by those interested in the Lake Superior mining industry are somewhat mixed, according to whether the company has hurt or helped the individual, but the general opinion is that only time can demonstrate whether the organization of the company inures to the benefit or detriment of the district as a whole. It is obvious that there are certain advantages, and disadvantages as well, which are inherent in such a combination of the major part of the great iron mines of the lake district.

"Among the advantages, which are no slight ones, labor should be insured steadier employment than would be possible under the old plan of many independent owners. The dominance of the United States Steel Corporation in the industrial world should also give a greater stabilty to the iron trade in all its branches, and it is undeniable that the iron industry in the past has been a somewhat erratic one, periods of famine alernating with those of plenty. From the nature of things it is impossible that the demand for iron and its product can remain at any constant ratio with population or wealth, but the acute phases of depression and 'booms' may be greatly modified by having the industry effectually dominated by a single management.

"The most obvious disadvantage of this combination of the leading mines in the hands of a single corporation is the elimination of the scores of independent companies engaged in the business of mining iron ore, and the appalling discouragements fronting the men of small means who desire to engage in the iron mining industry. There is still a limited field for the independent operator unbacked by millions, but it is a circumscribed one. A few men of ability as financiers and miners can find some return for their knowledge and capital in mining the silicious ores used as sweeteners for the fine-grained Mesaba ores, and in operating small mines, becoming the gleaners, so to speak, of the iron mining field. The few remaining independent corporations having large mines, experience, and capital at their command, can remain active producer upon a considerable scale; but, given the aggressive policy which can alone assure success to the United States Steel Corporation, it is certain that the number of large indenendent producers will become smaller, ratner than increase, owing to the occasional absorption of such properties by their great competitor. The attraction of gravitation, which rules in the mining as well as in the physical world, will work to the aggrandizement of the greater at the expense of the lesser bodies.

"By the process of natural selection, the United States Steel Corporation has gathered in its employ many—perhaps a majority—of the best mining men of the five Lake Superior iron ranges. They are experienced men, who have earned their advancement by hard and effective work in practically every case. For the reason that the management of the mines has been left in thoroughly experienced hands, the mining industry is moving along without friction, and the thorough systematization of the business should result in considerable economies—and in this connection may be stated that the saving of so apparently insignificant a sum as a single cent upon the cost of producing each ton of iron ore would result in a gross saving of nearly $200,000 per annum on the present total production of iron ore by Lake Superior mines

"A disadvantage of consolidation that will present itself to all thoughtful minds is the making of 'one man towns, of the various cities and villages where iron is mined. This disadvantage is evidently one which could and may occur. There is, however, a broadening effect about the conduct of large enterprises which makes for a wider grasp of sociological matters on the part of those in power. It must be said for the United States Steel Corporation that in the few months of its existence it has furnished steady employment at high wages to armies of men in the various mining centers of Michigan and Minnesota, and that evidences of dissatisafction on the part of employes are few and far between. That this state of affairs may continue permanently is greatly to be wished."—From Mines and Minerals, for April.

NOTES FOR THE CHEMIST.

Common Errors in the Determination of Silica.—by Dr. W. F. Hillebrand. (Jour. Am. Chem. Soc. April, 1902). Referring to the lack of uniformity in results of silica determinations in cement and cement mixtures sent out by committee of the New York Section of the Society of Chemical Industry, and published by Clifford Richardson in that Journal for January 15, 1902, Dr. W. F. Hillebrand, of the United States Geological Survey, calls attention to some of the common errors of the usual technical methods for silica determinations. The paper contains eight tables giving results which demonstrate the following points in the authors summary. "Statements of earlier writers are fully confirmed, that silica cannot be rendered wholly insoluble by a single or any number of evaporations with hydrochloric acid when followed by a single filtration, no matter what temperature be employed. but that two or more evaporations alternating with filtrations are necessary to secure satisfactory results."

"It is shown that the generally accepted view that any silica passing into the filtrate is wholly thrown down by ammonia or sodium acetate in presence of much aluminum or iron, is incorrect. Also that silica is appreciably soluble in melted potassium pyrosulphate and that consequently when siliceous oxides of iron and aluminum obtained in analysis are then fused, the silica contents are only in small part left undissolved when the fused mass is taken up with water or acid. Both these sources of error are avoided by separating all silica at start as above."

"The need of blast ignition in order to get the correct weight of silica obtained in analysis is proved. The opposite conclusion of Lunge and Millberg, being based on what seems to be different behavior of the silica derived from silicon tetra-fluoride, is therefore not justified."

Electro-Chemical Society—The first general meeting of the American Electro-Chemical Society was held at the Manufacturers' Club, Philadelphia, April 3, 1902. The society has over 300 charter members. Prof. J. W. Richards of Lehigh University was elected president; Profs. C. A. Doremus. W. D. Bancroft, Lewis Kahlenberg, William H. Wahl, J. C. Carhart and C. S. Whitney, vice presidents: C. J. Reed, of Philadelphia, secretary; and Pedro G. Salom, of the same city, was elected treasurer.

On Friday morning, afternoon, and Saturday morning, meetings were held in lecture hall of the John Harrison Laboratory of Chemistry, University of Pennsylvania. Twenty-two papers were read and discussed.

On Friday evening a reception was given at the Manufacturers' Club. The Society found time to visit Harrison Brothers & Company, where sodium is manufactured electrolytically, other places of interest in the city, and to the Bethlehem Steel Company. Lehigh Zinc Works, and Lehigh University.

Catalysis—James T. Conroy, B. Sc,. Ph.D. (Jour. Soc. Chem. Ind. Vol. XXI. No.5). The author refers to an address by Prof. Ostwald before the German Society of Naturalists and Doctors, at Hamburg last September, and quotes the following, "A catalytic agent is a material which affects the velocity of a chemical reaction without itself appearing in the final product." In other words, a catalytic substance is, according to Ostwald, incapable of starting a reaction: it can only affect the rate of change. The number and variety of reactions susceptible to catalytic influence are almost infinite. To quote once more, "There appears to be no kind of chemical reaction which cannot be influenced catalytically, and no form of chemical substance, be it elemental or compound, which cannot act as a catalyst."

The cataltyic agent may be a gas or vapor, a liquid or solid. The reactions effected may be of simple combination or dissociation; reduction: oxidation, which may be partial, complete, or fractional; hydrolysis; substitution, etc., together with combinations of these. The author describes all the important instances of catalytic action in both organic and inorganic processes, giving the chemical reactions and the various catalytic agents employed.

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EDITORIAL COMMENT.

The Reserve Force—From the facts of the existing conditions in iron and steel, and the outline of the future traced by today's facts, there is some ground for the fear that a reaction of more or less severity may break in upon the prevailing period of extreme activity and strength. In spite of the influence of the United States Steel Corporation, prices have been forced upwards, even compelling the Steel Corporation companies to pay at least a part of the extreme limit of values for raw material. In general the conditions today and those that ruled during 1899 are not dissimilar with the one exception that as a whole prices have not reached the high range which controlled materials during that active period. But in every other sense the actual conditions are quite similar. The consumers are not confronted by the same excessive prices as during 1899 but that matters little now because the buyers are unable to get supplies at whatever prices, so that the mere incident that values have not passed into the unreasonable stage has no particular significance.

As the facts of today show that if consumers want to get material they must place contracts and specifications a long time ahead, there seems to be a mild revolution in methods in process. For consumers to buy a year ahead may not appear to be a revolution of extreme mildness, and moreover it is a change which is not likely to become permanent. For the United States Steel Corporation to buy material so far in advance may be the right move, but the ordinary consumers will shy at the change. A whole year is a long time in the iron and steel markets, especially if it breaks into a period of extraordinary activity such as the present. Few consumers will place contracts now for deliveries next spring and if there should come a complete halt in the buying movement the usefulness of the new style of buying might be seriously doubted. In the absence of further information there are grounds now for doubting its efficiency.

The Mining Situation—The attitude assumed with the past few days by the coal miners of the Mountain district in refusing to accept the terms of settlement arranged for their district by President Mitchell, of the United Mine Workers, and in refusing to work under the terms prepared is merely the first of a series of a revolts that the national officers of the coal miners seem to be prepared for. This much was intimated in this column a short time ago and every additional piece of information touching the interests of the bituminous miners bears out the original statement. The officers of the United Mine Workers do not want any break, even the slightest, in the harmonious relations existing between the operators and workers in the soft coal regions. Naturally anything that tends to disturb those relations brings with it the hazard of a loss of the sinews of war with which the officers want to be well supplied for the struggle in the anthracite district. The soft coal miners are to be severely whipped into line.

It is unnecessary to enter into a discussion as to the merits of the case of the Altoona district miners, or in fact the miners of any other region. But the men at Altoona have so far uncovered the purpose of the officers of the United Mine Workers that it must be evident to the causal observer that there is some particularly urgent reason why the anthracite miners must take up two strikes within a year and why all other miners must stand ready to that end.

The outcry of the Altoona miners seems to indicate that the men are aware of what is being done rather more early than was supposed they would in view of their usual complaisance under similar circumstances. They have begun to refuse the terms made by the officers and have begun to ask questions in a serious way and in tones that demand serious and unequivocal answers. When those answers are given there will be others and it would not be a miracle if the United Mine Workers finally decided to postpone the strike in the anthracite districts. As the case stands the whole situation rests with President Mitchell.

EMIL SWENSSON, C. E., who for the past twenty-five years has been connected with the engineering departments of large ›mpanies both in Europe and this countr.- as opened offices in the Frick building this ty. Mr. Swensson is a member of the

Emil Swensson.

nerican Society of Civil engineers and ex-president of the Engineers' Society of ›stern Pennsylvania. He was for four- ›n years connected with the Keystone idge works of the Carnegie Steel Company, ccessively as chief draughtsman, superintendent, chief engineer and general manager, which later position he resigned last year. Through his connection with the Keystone bridge works he was made not only familiar with the whole subject of the bridge and structural business but was given special insight into the processes of economic and speedy execution of contracts for steel structures.

Through this connection he also came in intimate professional and business contact with the large engineering enterprises of the day, which included the building of the first skyscrapers; the Chicago Elevated Railroads; the Boston Elevated Railroad; the Boston Subway; the New York Rapid Transit overhead and underground systems; the Pittsburg, Bessemer & Lake Erie and the Union Railroads, the building of which required many heavy steel structures to carry the heaviest locomotives and trains of the new steel-hopper car. These roads were the first to introduce steel cars, of which the first two were designed and built under the personal supervision of Mr. Swensson.

One of Mr. Swensson's most notable pieces of work was the construction of the hot metal bridge over the Monongahela river at Port Perry and Rankin for the Union Railroad. The total weight of the latter is 5,135 tons with a total length of 2,328 feet, the 500 foot double track span of which is the heaviest span for its length in the world, containing over 2,800 tons of structural steel. The bridge is fire proofed throughout and was designed to carry molten metal from the Carrie furnaces of the Carnegie Steel Company, at Rankin to the steel, works at Homestead, and raw material to the furnaces. The structure is subjected to intense heat from the molten metal, sulphur fumes from locomotives and river steamers and adjoining furnaces and mills. In selecting a metal preservative the

Hot Metal Bridge at Homestead

Silica-Graphite paint of the Joseph Dixon Crucible Company, was chosen.

Previous to his connection with the Keystone bridge department of the Carnegie Steel Company, Mr. Swensson was for four and one-half years engineer on the projected and half completed South Pennsylania Railroad Company, which was acquired by the Pennsylvania Comppany.

Mr. Swensson is an active member of several scientific societies, at present vice-Chairman of the Executive Committee of the local committee of arrangements for the annual meeting of the Association for the Advancement of Science which will convene in Pittsburg in June. In his professional work he will make a specialty of all kinds of steel structures, including bridges, elevated railroads, office and mill buildings, ore and coke bins, and blast furnaces; ocean and lake piers and docks, manufacturing plants steam and electric railways, terminals and foundations.

A Mention of Men.

Charles A. Schwarm, Lorain, O., who for some time past has been superintendent of the Lorain Gas Company's plant, has resigned his position to accept the general superintendency of the William T. Morris Syndicate, Ithaca, N. Y., which has gas holdings in various cities of New York, Pennsylvania and Ohio. Mr. Schwarm brought the Lorain plant up to a high point of perfection and will prove valuable to the Morris interests.

Warner Shook, furnace manager for the Tennessee Coal, Iron & Railroad Company at its city furnaces, has been made furnace manager at Ensley, where the company has five furnaces, succeeding, A. P. McClure, who has been acting superintendent since the resignation of J. Shannon, who went to the Alabama Steel & Wire Company, at Ensley.

J. C. Maben, of New York, will go South week to take charge of the affairs of the Sloss-Sheffield Steel & Iron Company, vice E. O. Hopkins, resigned. It is rumored that Mr. Parsons of New York, will be the eventual president. It is denied that W. L. Sims will be again connected with the company.

Joseph D. Gallagher, formerly president of the Lappin Brake Shoe Company has been appointed vice president, and Joseph B. Terbell, former president of the Corning Brake Shoe Company, general manager of the American Brake Shoe & Foundry Company.

IN AND ABOUT PITTSBURG.

The property of the Standard Automatic Gas Engine Company, Oil City, was sold at receiver's sale on Thursday last to John B. Smithman for $45,000. It is highly probable that litigation will follow the sale. Mr. Smithman holds notes issued by the company to the full value of the price bid and alleges that these make him preferred creditor. The opposition allege that as these notes were given without the formal sanction of the board of directors he stands in the same position as all of the other creditors and that the amount received must be divided pro rata among such creditors. The purchase includes the real estate, which is considerable, the franchises of the company, machinery and fixtures, patents and application for patents and all and every kind of property the company possesses.

The H. Adler Manufacturing Company, 24 First avenue, this city, has bought five acres of ground at Carnegie, upon which it will build a plant for the manufacture of gas stoves and ranges. There will be seven buildings, including a foundry 70 x 260 feet; construction room 60x100 feet; ware house 60x200 feet; machine shop, packing rooms and press room 50x1[illegible] feet. The power will include a 150 horse power gas engine. Work on the buildings will be started in a few days, to be completed by July.

The Woodworth, Evans Company, of this city, will apply for a charter May 6. The incorporators are Austin M. Woodworth, Frank R. Woodworth, and N. F. Savage. The company will succeed Woodworth, Evans & Company, of this city in the manufacture of plumbers' brass supplies and the retailing of stoves and ranges. The company is operating a brass foundry and finishing plant at 434 Second avenue, which will be enlarged. The offices of the company are at [illegible] Wood sreet.

An application for a charter will be made April 22 by the Ellsworth Coal Company. The incorporators are A. A. Augustus, W. C. Sn[illegible], Clarence M. Fincke, 300 Westinghouse building; Edwin P. Young, St. Nicholas building; and Robert G. Woodside, all of this city. The company willl develop coal and mineral lands in the district.

An application for a charter will be made May 6 by the Railway Steel Casting Company. The incorporators are G. W. Eisenbeis, C. C. Smith, and J. W. Anderson, all of Pittsburg. The company is considering several sites within 15 miles of Pittsburg upon which to locate a plant, one of which will be definitely decided upon within the next week, when work will be started on the construction of a plant. The members of the new company are also connected with the Union Steel Casting Comp ny, of this city, which is engaged in producing a general line of steel castings. The new plant will be devoted entirely to railroad work.

The Monongahela Foundry & Forge Company, recently incorporated with $50,000 capital stock, has secured the buildings at Monongahela City, formerly used by the Pittsburg Stove & Range Company, for the purpose of making grey iron castings and forgings. The company has equpped part of the building for foundry work and will make a specialty of light machine molded castings. No definite plans have been outlined for the forge department. The officers and directors of the company are: C. S. Johnson, president; Alfred Lotz, vice-president, both of Mononghela City; directors, Samuel McElroy, George W. Rhodes and H. G. Wasson, of Pittsburg.

The Pittsburg Terminal Railroad & Coal Company will apply for a charter April 29. The incorporators are Owen S. Cecil, John S. Wendt and John M. Freeman, of this city. The company will develop coal and clay lands. Temporary offices are at Room 66 St. Nicholas building, this city.

The Pittsburg & Lake Erie Railroad Company, this city, is taking bids for a coaling plant at Haselton, O., and another at Groveton. The company has awarded to James Stewart & Company, of Pittsburg, the contract to erect a round house and several small buildings Haselton, to cost $100,000. The builldings are to be completed by July 1.

The Pittsburg Construction & Engineering Company, this city, secured the contract from the United Real Estate & Construction Company for a 100 horse power steam and electric plant. The plant will include two 56 horse power Harrisburg engines to be direct connected to two 30 k. w. Crocker-Wheeler generators.

The company has also received an order from the Wheeling Mold & Foundry Company, Wheeling, W. Va., for 11 motors, 10 of five horse power each and one of 50 horse power.

Oliver P. Scaife & Company, limited, have placed an order with J. D. Lyon & Company, merchant engineers, this city, for a 60 horse power Mertes duplex gas engine, for their plant at Hazelwood. Lyon & Company have also recieved an order from the Oakdale Cok works, Oakdale, for a 60 horse power gas engine.

The Humbert Stove Company, Lower Turkeyfoot township, Somerset county, has been incorporated with $10,000 capital stock by Irvin T. Huff, John C. Forsyth, F. A. Walker, Rufus King, Jr., and W. L. Brinton.

The Kinzer & Jones Manufacturing Company, of this city, is in process of dissolution. The company has been engaged in the foundry business at 101 Penn avenue.

NOTES OF THE INDUSTRIES.

The contract for the erection of the pipe mill of the Susquehanna Iron & Steel Company, Columbia, Pa., has been awarded to a Pittsburg firm. The shareholders who subscribed for bonds have paid in 20 per cent of the money, and a call has been issued for the balance, 80 per cent to be paid on or before May 1. The work will be commenced as soon as the money is paid into the treasury.

The capital stock of the Cincinati Iron Store Company is to be increased from $50,000 to $100,000. The company has decided to establish a large beam and structural yard in Cincinnati. A deal has been practically closed for a location, and it is proposed to carry all kinds of structural material, and make the yard a distributing point for Cincinnati and tributary territory.

The Brown-Cochrane Company, Lorain, O., which has recently been organized by merging th interests of the Brown Gas Engine Company, Columbus, Ohio, and the Cochrane Company, Lorain, will erect an additional building to be usedas a machine shop and finishing department. New tools will be placed throughout the plant.

The Colburn Machine Tool Company, Franklin, Pa., has the foundations ready for its new machine shop. The contract for the structural material has been awarded the American Bridge Company but the work has not been commenced. It is the intention of the Colburn company to install about six small jib cranes along the sides of the machine shop and later add traveling crane. The contracts for the cranes are still open.

The American Laundry Machine Company, whose plant on Pearl street, Cincinnati, was re-

cently destroyed by fire, has bought a five-acre tract in Norwood for a new plant. The site adjoins the Globe-Wernicke factory, in the B. & O. S. W. railroad. Work on the buildings will begin at once

The new 26-inch mill at the Bessemer plant of the Republic Iron & Steel Company, Youngstown, O., was started up last week for the first times since the work on its erection was commenced about a year ago. The plans of the new billet mill were designed by S. V. Huber & Company, of Pittsburg, mechanical engineers, and the work of building the mill was largely under the personal supervision of Samuel McDonald, who recently resigned his position of superintendent of the Bessemer plant.

The Marinette Iron Works Company, Marinette, Wis., has decided to remove its plant to Warren, Pa., where better facilities are to be had. It is proposed to erect a foundry 350 feet long and a machine shop 400 feet in length, both built of steel and brick. The present location of the company's plant at Marinette is between a railroad and a river and there is no room for enlarging.

The Gray-Blaisdell Company, Bradford, Pa., builders of air compressors and gas engines, will soon take action on the proposed new foundry. The plans will call for a plant about 120 x 140 feet, built of steel and brick. It is the intention to make the foundry one of the most up-to-date in the country. A 20 ton 50 foot span crane will be installed.

Negotiations have been closed for the sale of mines which will result in the resumption of iron ore mining at Boyertown, Pa. The Boyertown Company has purchased all the iron ore properties in that place and has obtained mineral rights on other promising ore sites, the coal aggregating about 200 acres.

The New Castle Forge & Bolt Company, New Castle, Pa., will, besides making a full line of bolts, nuts and rivets, soon begin the manufacture of chain. The necessary chain machinery has been purchased from the Turner, Vaughn & Taylor Company. Cuyahga Falls, O. and from A. S. Standish, Pittsburg.

The New Jersey Zinc & Iron Company is making extensive and costly improvements to its plant at Palmerton, Carbon county, Pa. General Superintendent G. G. Convers says 96 oxide furnaces and two 70 foot spiegel furnaces are be erected the coming summer.

A meeting of the stockholders of the Youngstown Manufacturing Company, Youngstown, O., is to be held May 10 to take action upon the question of authorizing an increase of the capital stock from its present amount of $300,000 to $500,000.

The Conradson Lathe Company, Warren, Pa., has awarded the contract for its new plant to the Columbia Bridge Company, Pittsburg, Pa. The machinery equipment will be furnished by the U. Baird Machinery Company, and Brown & Zortman Machinery Company. Pittsburg.

J. H. Day & Company, of Harrison and Logan streets, Cincinnati, manufacturers of sifting and special grades of machinery, are having plans drawn for a large addition 105 feet deep on Colerain avenue about 100 feet, of brick with glass roof.

Extensive improvements are likely soon to be made at the Falcon plant of the American Steel Sheet Company, Niles, O. The improvements which consists of the addition of two large sheet mills, have been contemplated for some time.

The Chillicothe Steel Company. Chillicothe, Ohio, promoted by John B. Hastings, has ceased buisness. The company was organized to test Mr. Hastings' secret steel process which was said to be unsatisfactory.

Lewis Haven's Sons, Philadelphia have been awarded the contract for a large trestle 700 feet long, and extensive alterations to the plant of the Pond Machine Tool Company, at Plainfield N. J.

A large addition is to be built to the North Brothers' Manufacturing plant at Philadelphia. It will be of brick, five stories in height, and will measure 40 by 25 feet.

Contracts for the equipment of the Sharon Foundry Company's plant, at Sharon, Pa., are being placed. The Shaw Electric Crane Company, Muskegon, Mich., will furnish the crane.

The Thew Automatic Shovel Company, Lorain, O., has foundations laid for a new brick and steel addition to its plant, which will be about 100 feet in length.

A four story addition to the tool department of Pratt & Whitney, Hartford, Conn., will be built soon. The extension will measure 170x[illegible] feet.

W. H. Lawrence, Milton, Pa. is endeavoring to secure a location at Clayton, N J., to buiid a plant to make iron fence posts.

It is said that the Pittsburg Plate Glass Company, Kokomo, Ind., is experimenting with a new process to manufacture fire brick from waste glass and sand.

NOTES OF THE SOUTH.

Pig iron, steel and pipe shipments from the Southern field in March were as follows: pig iron from Tennessee and Alabama 147,224 tons, of which the Birmingham district furnished 77,-489 tons the Sheffield, Ala., district 16,295; the Annison, Ala., district 21,101, the Chattanooga district 17,580; the Middlesboro district 4,557; the Nashville district 10,335 tons, exported 180 tons; cast iron pipe shipments from Alabama and Tennessee were 16,184 tons, of which the Birmingham district furnished 8,194 tons, Anniston 3,317 and Chattanooga 4,673 tons; steel shipments from Ensley 8,383 tons, the heaviest movements yet recorded: pipe exported 606 tons.

It is understood that either J. D. Moore, of the Moore & Handley Hardware Company, or W. H. Kettig, of the Milner & Kettig Company, both of whom are directors in the National Hardware & Metal Company, will be the Southern manager of the concern. Mr. Moore is understood to have the option, but may decline on account of his health, in which case it will go presumably to Mr. Kettig.

The following officers and directors of the Woodstock Iron Company spent several days in Anniston last week looking over the properties of the company, which are being substantially improved: S. M. Lehman, president of the Anniston City Land Company, and the Woodstock Iron Works; P. J. Goodhart, treasurer of the Woodstock Company; J. D. Probst, Morris Fatman, directors.

R. R. Zell, J. L. Burns, A. L. Ezell, T. M. Byars, J. B. Stagg and William E. Byars are among the incorporators of the Reid's Gap Oil, Gas & Mining Company, capital $100,000. The company is an off-shoot of the Steel Cities Railway, Light & Power Company, recently organized with capital of $1,000,000. Land holdings have been secured in Blount county on the Warrior river.

Victor Moore, F. L. Clarke and W. M. Moore, sole stockholders in the Alabama Tube & Iron Company, have filed a petition increasing the capital stock of the company from $150,000 to $200,000. The company owns and operates the wrought tube works at Helena, Ala., having converted the old Helena rolling mill into a tube plant, The plant has been very successul.

The machinists on the Southern Railway, who struck last May, returned to work Monday morning, a settlement having been effected between them and the railroad company. The terms are not given, but are said to have been satisfactory on both sides. The men struck for a nine-hour day with ten hours' pay.

The St. Stephens Oil Company, capital $25,000, has been organized by W. T. Thompson, former governor Joseph F. Johnston, J. B. Cobbs, president of the Alabama National bank, and others. They are drilling for oil at St. Stephens, Ala.

Two hundred and fifty iron molders in the Birmingham district have secured an advance of 25 cents per day in the twelve contract machine shops and foundries, making the minimum now $3, where it was formerly $2.75 a day.

C. E. Buek & Company, owners and operators of the Trussville, Ala., furnace, are building fifty more coke ovens, which will give them a complement of 150.

W. H. Morris, representing the Birmingham Commercial Club, has gone to Pennsylvania to interest capitalists there in the Birmingham district.

The city of Huntsvile, Ala., is negotiating for the location there of a $750,000 cement factory.

WEST VIRGINIA NEWS.

One of the most important coal enterprises exploited the past week by West Virginians is that of F. P. Jones, of Wheeling, and Hutchinson Brothers, of Fairmont, who have secured [illegible] acres of ground on the Ohio side below Bridgeport and will open mines at once. The same parties have begun the development of a 1,000 acre tract of coal and timber and near Birmingham, Ala.

The Fostoria Glass Company, of Moundsville, has decided to enlarge its facilities by the erection of a new building 80x250 feet, a fourteen-pot furnace and five lehrs. The improvement will require the employment of 200 new men, and will make the Fostoria the largest independent glass works in the country.

Charles F. Teter, of Phillippi,; V. C. Norton, of Columbus, O.; and H. I. Boreman, F. C. Pifer and J. S. Pifer of Buckhannon, W. Va., have organized the Holly Grove Lumber Company, with a capital of $300,000 to operate new mines near Belington, W. Va.

The Century Coal Company, of Century, W. Va., will increase its capacity by 500,000 tons this year. It is understood that the company is preparing to install considerable new machinery.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—Gradually the markets have become quieter in spite of the attempt to renew the fear through the heavy purchase of Bessemer pig iron tonnage a week ago. While it would be imbecile to try to deny that there is not enough iron and steel to meet the demands for prompt shipments, it is equally absurd to try to establish as a fact that there is no iron and steel in existence available for use in the steel finishing plants. There is iron and steel in abundance but there is not and there never was, and never will be a time when the greater portion of any year's tonnage will be available for spot shipment off hand at any time the consumers choose to call for it. That is somewhat the case now. If the consumers had not co-incidentally entered the market at the same time the cry of shortage and coming famines would not have been heard or at the worst the tones would have been much more subdued. Instead of a yell there would have been a murmur. The fact is that there is iron and steel, as evidenced by the steady operation of mills everywhere but there is not enough to meet the full demand for spot shipments, and if there were it would be interesting to have explained how the consumers could make use of it all at one time. The buying has been heavier than usual by a number of the larger consumers but that extra heavy buying was more as a precaution than because of the actual immediate necessity for material. There was a fear, quite general for some time, that there would be or might be, a serious famine in iron and steel and those who had abundant resources went into the markets for large lots of material. Other buyers exhibiting less foresight, or having less resources did not take part in that extra buying because they could not, and are now numbered among those caught by the shortage.

The purchase of Bessemer pig tonnage by the Carnegie Steel Company removed considerable iron from the markets up to the end of this year but there is still some merchant tonnage left for the last quarter of the year. The valley merchant furnaces have disposed of the greater part of their capacity up to the end of the year, all of it for the first three quarters, but there remains a small portion of the valley stacks' capacity unsold for the final three months of the year.

The recent transactions have turned the market prices of pig iron upward and today it is doubtful if Bessemer could be bought at the valley furnaces for less than $19 per ton, for spot [illegible]. For the last quarter of the year the price is [illegible] to be about $18.50 at furnace. Mill iron is still gaining in strength and this week is quoted firmly at $19.25, Pittsburg delivery. Billets remain unquotable but the minimum, if there were any raw steel for sale, would not be less than perhaps $34 per ton at mill. Pittsburg base.

The run of cars is much improved over the conditions of a few weeks ago but there is still much to be remedied on the threat of the railroad companies. The steel finishing plants are still compelled to store stuff though to less extent than formerly.

In both iron and steel new business remains out of the question. In finished steel deliveries are held back into the third quarter on old contracts so that consumers would gain nothing if their contracts were accepted, and by declining business at this juncture the mills are doing perhaps the best that could be done. There will be fewer complaints and less urging through the remainder of the year, a point which the producers no doubt want to have firmly established so far as the situation will permit.

Since the advances in the price of hoops to [illegible] cents per pound and common bar and steel to $1.70 per 100 pounds there have been no changes in prices though in few cases, if any do prices [illegible] actual sales are with official figures.

CURRENT QUOTATIONS:

Basic	$17 25		Splice bars	1 50
Bessemer		19 75	Angles	1 60
Charcoal, hot	28 00		I beams	1 60
Charcoal, cold	25 00		T beams	1 60
Fdy, Nhn		19 50	Z beams	1 60
Fdy 2, Nhn		19 25	Channels	1 60
Fdy 3, Nhn		18 50	Boiler plates	1 75
Mill Iron	19 25		Fire-box	1 85
Fdy 1, Shn	19 50		Sheared	1 65
Fdy 2, Shn	19 25		Tank	1 69
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50
Grey Forge, Shn	18 60		No. 1 wrought	20 00
Bessemer billets	36 50		No. 1 cast	17 00
Open hearth	34 00		Iron rails	25 00
Steel bars	1 90		Car wheels	18 0
Iron bars, refined		2 00	Cast borings	10 00
Light rails		37 00	Turnings	13 00
Standard sections	28 00		Sheets, 26	2 90
Bolts, iron, sq nut	2 50		Sheets, 27	3 00
Hex nuts	2 65		Sheets, 28	3 10
Spikes	2 00			

Philadelphia—The iron and steel situation still refuses the control of the conservative forces. The general tendency of prices continues upward. At the same time it can be said that the repressive policy of the larger producers has conserved the ends of wisdom to the extent that it has so far prevented "runaway markets." All grades of pig iron are higher now than they were a week go, and the scarcity is as great as ever.

Prices of pig iron in the local market are hardly quotable, as there is no material offering. They are, however, higher than they were a week ago. As near as can be given, today's

prices for the standard brands of Northern iron at Philadelphia and nearby points are about a follows: No. 1 foundry, $20.50 to $21.50 for shipment to July, and $20 $21 for the last half of the year: No. 2 foundry, $19.75 to $20.50 and $18.50. to $19: gray forge, $18.25 to $18.50 and $17.50 to $18.

Steel billets are very hard to get at any price. Makers name $33 to $33.50. but they are sold so far ahead that they are not taking on any new business.

In the manufactured iron and steel trade the point of principal interest is the steadily and increasing tonnage on mill books. The demand appears to be getting larger all the time, and orders are being turned down on all sides particularly for plates and structural material. Bars and sheets are also in good request. Official prices are unchanged, but it is doubtful if orders could be placed without paying advanced rates.

The Southern Pacific system has placed an order for 18,000 tons of steel rails with an Eastern mill for delivery during the next five months. This is one of the largest orders that has been taken for some ime. Standard sections are still quoted at $28 at mill.

CURRENT QUOTATIONS:

Foundry, 1	$20 00	21 5	Girder rails	32 00	32 50
Foundry, 2	18 50	20 50	Angles, 3" & lr'gr		1 80
Gray Forge	17 50	18 50	Under 3-inch		1 90
Bessemer billets		33 50	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown & Company:—For the first time in the memory of the present generation of iron melters, foundries by the score are closed down for want of pig iron. The stop in most cases is of short duration, but it checks the out-turn of finished work at a time when it is most urgently needed. The short supply is not due to delay in the placing of orders, for most consumers have covered their wants pretty fully by contracts. It is due to the inability of furnaces to make the iron as fast as needed. There is no very considerable curtailment of output of pig iron because of trouble in assembling materials, as was the case in January, February and March. There can be but slight increase as the year wears on, for nearly the whole available capacity of the country is active.

Relief, therefore, must come from slackening demand or from importations. Of the slackening demand, however, there are so far no signs. On the contrary, fresh work is coming out constantly, and the last week has brought out new inquiries for pig iron in round lots for summer deliveries, which could not be met North or South.

Prices undergo no change. For early deliveries there is no iron. For late deliveries, makers show no desire to exact high figures. The very large purchase of Bessemer by the United States Steel Corporation running to April 1903, at $16.50 at Valley furnaces, if correctly reported, tells both of moderation of views as to prices, and of the necessity of a long look ahead of supply of materials is to be assured.

There is quite naturally a crop of new furnace enterprises North and South, and if half of them are carried out, there will be iron enough for all, and doubtless prices low enough for all, before the end of 1903.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$19 50	21 00	Angles	2 00	2 50
No. 2X fdy Jersey City	17 65	20 00	Tees	2 00	2 50
No. 2 plain Jer. C.	17 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	21 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	20 00		Com. base, bars per 100 lbs	65	1 70
No. 3 fdy N. Y.	19 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	17 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 0	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 0
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

Cincinnati—There is a great demand in this market for charcoal, car wheel, and malleable iron. A small lot was sold Saturday that happened to be where it could be gotten quickly to the consumer, and it brought a premium way above quotations. Many furnaces still refuse to take orders. This necessarily, has made a quiet market. The whole interest centres on the future, on the problem of getting iron already bought brought forward fast enough. The railroads are doing better, but there is still great room for improvement. Shipments, for example, that were made March 20 to point in the middle West are still in transit.

Sales have been limited by the extreme scarcity of iron. It is apparent that consumption has been in excess of expectations, for a number of concerns who thought their wants covered have found it necessary to obtain additional supplies. Buyers hardly know whether it is better to pick up what they can get the last of the year, or to wait till later, and see what may turn up. Foundries are certain to be full of work.

Little is being done in the billet market and prices are hard to quote as there are few sellers.

Finished iron and steel continue in urgent demand and deliveries for various causes are as

hard to get as at any time for some months. This is particualrly true of structural material, the mills being simply gorged with tonnage and sold up for six to eight months.

Plates are still in active demand and the market is considerably firmer than a week ago. Bars are also in better request and prices are gradually seeking a higher level. On all new business the price is $1.60 as a minimum.

A good deal of tonnage is being placed for sheets, and, as a rule, the mills are well filled up with orders. Quotations are nominally unchanged but in most cases considerably more is necessary to secure anything like reasonabe attention. There continues a fairly brisk trade in sheets, and other finished products for the same consuming manufacturers. Prices are without quotable change but are quite firm. Stocks of finished metals in store are low.

The market for scrap has reached its height and the next development will be towards an easier condition. Quotations are irregular and the range of values is somewhat higher. More scrap is appearing but not in quantities sufficient to glut the market.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$16 75	Standard Sections	29 90	30 90
South fdy. 2	14 75	16 25	Sheet, 26	3 40	
South. fdy. 3	14 25	15 75	Sheets, 27	3 50	
South. fdy. 4	13 75	15 25	Sheets, 28	3 60	
Grey forge	13 75	15 00	Angles, 3 to 6 in	1 70	
Mottled	13 50	15 00	Angles, 1¼ to 2½	1 82	
Shn. 1, soft	15 25	16 75	Beams and Chanls		
Shn 2, soft	14 75	16 25	15 in and under	1 70	
L. Superior, fdy. 1	18 10	18 75	I b'ms 18, 20 24 in	1 80	
L. Superior, 2	17 60	18 25	Tees	1 75	
L. Sup'r char'l c w	21 00	22 00	Z's	1 70	
Hang'g r'k ccl, 1	22 50	23 00	1 wrought scrap	14 00	15 00
Soun ccl c w	20 85	20 60	Steel milting stock		
Jaksn cy. sil'v y 1	18 35	18 60	gross ton	13 00	14 00
St'l brs base hlf ex	1 72		No. 1 cast	12 00	13 25
Iron bars	1 82		Old iron rails g t'n	18 50	19 50
Flange plates	1 80		Old car wheels	15 25	16 00
Tank steel	1 70		Cast borings	6 50	7 00
Ordinary fire-box	1 90		Turnings	7 00	7 75
Light rails	39 00				

Chicago—Southern makers of pig iron who have been out of the market for weeks hope for reports from the furnaces which will enable them soon to respond to the urgent requests of their customers for quotations at least. But up to the present time, there is little if any relief from the famine-like state of the pig iron market in the West. Scarcely any iron is offered for spot delivery and that little finds more than ready sale. The result is that prices are irregular, with foundries often bidding above previous prices. The general level may be no higher than a week ago, but the tone is very strong. Inquiries on the desks of sellers both for present and future shipments are accumulating and now amount to a good round tonnage.

For finished material there is little change in the situation. Strong pressure continues to be felt in the store trade and while prices may be no higher it is because sellers are pursuing a conservative policy, limiting their sales usually to their own immediate trade. Possibly receipts of steel are improving, but it is not noticed, so far behind in their orders are all sellers. The bar trade is quieting down steadily but for small and moderately large inquiries there remains a fair inquiry.

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CURRENT QUOTATIONS:

Bessemer	19 50	20 00	Sheets, 26 store	3 25	3 30
Fdry North 1	19 00	19 50	No. 27	3 35	3 40
Northern 2	18 50	19 00	No. 28	3 45	3 50
Northern 3	18 00	18 50	Angles	1 75	
Southern 1	18 65	19 65	Beams	1 75	
Southern 2	18 15	19 15	Tees	1 80	
Southern 3	17 65	18 65	Zees	1 75	
Forge	17 15	18 15	Channels	1 75	
Charcoal	21 00	22 00	Steel melt'g scrap	17 30	18 00
Billets, Bessemer	32 00	34 00	No. 1 r. r. wrought	20 00	21 00
Bars, iron	1 85	1 95	No. 1 cast, net ton	14 50	15 00
Bars, steel	1 75	1 80	Iron rails	25 00	26 00
Rails, standard	28 00		Car wheels	19 00	20 00
Rails, light	32 00	36 00	Cast borings	8 00	8 50
Plates, boiler	1 90	2 00	Turnings	13 00	11 00
Tank	1 75	1 80			

Birmingham.—The only feature of the iron market is the continued discrepancy between the quoted price and the price obtained. Little iron is sold, but what goes brings $14 for No. 2 and $16 for No. 1 foundry. This is really the basis of the market so far as spot sales are concerned. The operators have had urgent requests for all grades at any price, the consumer leaving it to the furnace makers to fix the price. The operators are unable to keep all their furnaces going on account of the scarcity of coke. Owing to the recent rains, rendering the coal mines idle for ten days to two weeks, the big producers decline to furnish their regular customers among the foundries and machine shops and they narrowly escaped being compelled to shut down for awhile. Coke from Powhatan; W. Va., came into Birmingham, in the emergency, at $7.25 per ton delivered, the local price being $3.25 per ton. The foundrymen, however, were not averse to the foreign make even at the higher price as it melts over twice the amount of pig iron per given quantity used. The Sloss-Sheffield Steel & Iron Company will do well to manufacture during this year all the iron it has on its order books, and this is the case with many others. An impression exists on very good foundation that the Woodward Iron Company is about to commence operations on the erection of another furnace at Woodward, where it has the two most successful financially in the South. The rumor continues persistent which has it that the Alabama Steel & Wire Company will also

build one or two furnaces. J. J. Shannon, who recently went with this concern is now in Pennsylvania studying furnace methods etc, in that section. The furnace and mine operators continue to import a large quantity of negroes into the state to meet the demands at the various plants for common labor. Offers have been made for 20 pound rails at $37.50 per ton in small lots. The top notch period continues with no signs of abating.

CURRENT QUOTATIONS:

No. 1 fdy. Sohn	$12 50	13 50	Tank	1 80	
No. 2 fdy. Sohn	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy. Sohn	11 50	12 00	No. 1 wrought	14 00	
Grey forge, Sohn	11 00	11 50	No. 1 cast	12 00	
Billets	23 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	310	3 5o
Fire box	2 00				

Coal.

Pittsburg--The intended extensive operations at railroad mines have been hindered by the unpreparedness of the railroads and the conditions at the lake docks and in spite of the attempt to open the shipping season a month in advance of the usual date little has been done. The movement of coal for local consumption is somewhat stronger and about up to the normal but the lake shipments amount to next to nothing.

Cincinnati—Anthracite coal is coming a little more freely than a week ago, and the movement of bituminous is heavy both to the interior and to the head of the lakes. A good deal of the latter is being supplied from Western mines.

Cleveland—The coal situation differs but little from that of the ore. Boats are offered freely and many have been chartered. Shippers however. are at a loss to obtain cargoes since the movement to the lakes while brisk, is not up to the demand. The railroads having been caught unawares are not able to furnish the cars. There was no mistaking the upper lake demand but that was not all sufficient.

Chicago—The principal obstruction to an active market for bituminous coal in the West is the refusal of the railroad companies to guarantee their present freight rates for a year. The traffic people have not fully recovered their equilibrium from the upsetting decision of the interstate commerce commission and are moving very cautiously. Buyers of coal find that prices named average up a little higher than last year and on that account are slow to close. Sellers are unwilling, moreover, to assume the risk that the carriers may put up prices later in the season and are therefore indifferent to try contracts until the railroad atmosphere clears. Generally speaking there is on track in the West an ample stock of all kinds of fuel, demand having decreased considerably for those products which previously had been scarce. And those that had been in too abundant supply are favored by decreased shipments from mines. Inquiries denote a large business, once it is fairly stated. Prices for spot shipments are slightly subsiding perhaps, except on those products, with which the market has been flooded for weeks past, as in Hocking. For that product the market is hardening.

Coke.

Production made some gains in the Connellsville region proper during the week but in the Masontown field there was a falling off. The number of active furnaces remains the same and the improvement in production was only slight. Shipments decreased to Pittsburg and river points but advanced some to points East and West. The better weather and general improvement in conditions about the ovens has brought the capacity up to the highest point of efficiency while the supply of cars and locomotives from the region has not kept pace with the better working time. The improvement however, has been sufficient to keep a normal supply of fuel at the blast furnaces, while the foundries are short of coke as well as of iron. The blast furnace operators have ceased to complain and are comparatively easy as to fuel supply. The foundrymen are willing to pay handsome premiums for coke but will be short for some time.

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Last week	11,405 cars.
Shipments in tons for week	245,224 tons.
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Masontown Field	
Shipments for week	559 cars.
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Decrease	61 cars.
Shipments in tons	14,534 tons.
" last week	16,120 tons.
Decrease	1,586 tons.

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Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
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Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including April 14, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS
Transit	323,504	187,129
Tidewater	143,367	44,890
Southwest	20,284	107,377
Eureka	14,969	451,210
Buckeye. Macksburg oil	2,772	181,497
New York Transit	498,903	
Southern	333,602	....
Crescent	91,777	....
Total	1,429,182	972,103
Daily averages	109,968	75,152
LIMA.		
Buckeye / Indiana Local Division	545,479	640,998
Daily average	41,190	49,807

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
April 9	$1.30	$1.15	$1.15	$0.83	$0.80	$0.80
April 10	1.30	1.15	1.15	0.83	0.80	0.80
April 11	1.30	1.15	1.15	0.83	0.80	0.80
April 12	1.30	1.15	1.15	0.83	0.80	0.80
April 14	1.30	1.15	1.15	0.83	0.80	0.80
April 15	1.30	1.15	1.15	0.83	0.80	0.80

The Metal Markets.

LONDON—Tin—£125 12s 6d—£125 10s Sales, 670 tons spot; 1,180 tons futures.

Copper—£53 10s £52 17s 6d Sales, 550 tons spot; 1,000 tons futures.

Lead—£11 10s-£11 8s 9d.

Spelter—£17 16s 3d-£17 15s.

NEW YORK—Tin—$28.12½—$27.75.

Copper—Lake. 12¼; electrolytic, 12.⅛-12; casting 12—11¾.

Lead—$4.15.

Spelter—$4.50-$4.42½.

ST. LOUIS—Lead-4.00$3.97½.

Spelter—$4.25.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots; lot of 100 pounds, $1 10 per lb.: special price on large lots.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	2 55
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	10.75	c
Copper, light bottoms	9.50	c
Heavy Composition	10.75	c
Brass Turnings	7.00	c
Heavy Brass	8.62½	c
Light Brass	7.87½	c
Heavy Lead	3.90	c
Tea Lead	3.70	c
Zinc Scrap	3.12½	c
No. 1 Pewter	19 00	c

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.9[illegible] Bessemer Steel, 100 lbs. $4.75.

In these days of organization of large manufacturing interests, the ownership of such property is becoming more and more thrown into the shape of stocks and bonds.

Pittsburg is becoming not only the center for the manufacture of iron and steel, but is growing in importance as a place for the sale of iron securities.

Robert C. Hall, member of the Pittsburg Stock Exchange, will be pleased to give any information possible at any time concerning these securities, or make transactions therein.

Telephone Long Distance 3613 Court, or write No. 345 Fourth Avenue, Pittsburg, Pa.

ɿuben Miller Retired.

Reuben Miller, chairman of the executive ›mmittee and treasurer of the Crucible Steel ompany of America, retires from all active articipation in the affairs of the company lay 1. His resignation from these offices and ; a director of the company was accepted by the ›ard of directors at the meeting last week.

Mr. Miller's action, it was announced by ficials of the Crucible company, is due entire- of ill health. He returned recently from a trip › Mexico, where he was taken very ill. He is nderstood now to have passed the critical eriod of his illness.

Mr. Miller reluctanly took an active place in ie company at its formation. He accepted the fice of treasurer with the understanding that e might retire after a year. He has been one the most successful of Pittsburg's steel manu-cturers and his retirement now is to secure the st that he so well earned after years in active ork. His place in the board of directors will ›t be filled till the next annual meeting of ie company.

The chairmanship of the executive committee the company was largely an honorary position ıd no successor to Mr. Miller has been appoint-l to this office, which may now be abolished. ılius Beiler, president of the Third National, ınk, who has been assistant treasurer of the ›mpany, is expected to become the treasurer, ıd the second assistant treasurer, John Neeley, ill probably succeed Mr. Beiler.

Mr. Miller's withdrawal from active work in ie company places additional work with Presi-›nt C. H. Halcomb, regarded as the most ficient crucible expert in the country. On count of the many details devolving on him r. Halcomb has retired as president of ie subsidiary St. Clair Steel and the St. Clair ırnace Companies, which are erecting a large rnace and steel plant at the new town of airton.

Further than this the company will be ready a few months to start its extensive operations Clairton, and it was required that an expert this line of business be at the head of it. W. Snyder, a director of the Crucible company ıce its last annual meeting and a leading ex-rt in blast furnace and steel plant practices, ıs accordingly rendered the office of president the two St. Clair companies. Mr. Snyder cepted the offices. It is understood that he ll continue in his present business interests well as taking up the leadership in the raw ıterial end of the Crucible company.

The steel plant at Clairton, including 12 50-ton en hearth furnaces, is expected to be started for operations in July or August. The first of the three 450-ton blast furnaces will be fired a few months later.

Large Fire Brick Deal.

A deal has just been consummated by Messrs. Scott Dibert and John H. Waters, Johnstown, Pa., W. S. Ravenscroft, Ridgway, Pa., Francis J. Torrance, Pittsburg and others for the purchase of the fire brick plants of the Savage Fire Brick Company whose main office is located at Hyndman, Pa. The Savage Company operated plants at Hyndman, Keystone Junction and Williams, Pa., with a combined daily capacity of 15,000,000 brick. The resources of the three plants comprise 2,297 acres of coal and fire clay, which will produce enough of each of these necessities to operate all three plants for a great many years. All the plants are well equipped with machinery.

The Williams and Hoblitzell clay mines consist of three openings for the extraction of flint and plastic clays, three incline planes, two tipples and necessary machinery, with almost 2,000 acres of land in fee simple, 367 additional acres being held on lease. The land is also underlaid with coal. The Glade City mines at Keystone Junction are not being worked at present owing to the burning of the tipple nearly two years ago, which is now being replaced and will tap 581 acres of land 450 of which are underlaid with both hard and soft clays. Besides the machinery in use at the plants, there is a special brick machine and a four mold dry press, which are held in reserve.

By coming into possession of these works Messrs. Dibert, Waters, Wagoner and Torrance, in conjunction with their silica brick plant at Mt. Union, Pa., one of the best equipped silica plants in the country, pass into the front rank of brick manufacturers in the United States. The new stockholders took possession of the properties, April 10th. The officers are as follows: President, Mr. Dibert; vice-president and treasurer, Mr. Waters; secretary, Dr. Wagoner.

The steamer Paliki arrived at Ashtabula April 14 with the first cargo of iron ore to the United States from the new Canadian ore fields this season. The arrival is unusually early. Canada's newly developed territory about the Michipicoten mines is promising, and the probability is that twice as much ore will be shipped to Ohio harbors this season as last.

The Hart Coal & Coke Company of Fairmont, has taken possession of its new purchase, the Wegee Coal works, below Bellaire, O.

Will Soon Make Brick.

The West Branch Fire Brick Company, Renovo, Pa. which was recently organized, has about completed the work of building its plant and fully expects to be making fire brick about the beginning of May. The works contain the latest type of machinery throughout and possesses features of construction seldom noticed about a brick plant. The plant contains a 7½ foot wet and a 9 foot dry grinding pan made by the Clearfield Machine Shops, limited, Clearfield, Pa.; a No. 5 crusher made by the Good Roads Machinery Company, Philadelphia, which has a capacity of 40 tons per hour. The dry floor has 16,000 square feet of surface. A four-mold brick press machine made by the United States Brick Press Company, Erie, Pa., will have a capacity of 20,000 brick in 10 hours. The crusher is run by an independent engine of 35 horse power and is of the latest type. The power plant was furnished by Wickes Brothers, Pittsburg, Pa., and consists of two 100 horse power boilers and one 175 horse power Armington & Sims engine.

The clay is mined about one half mile from the top of the incline which is of double track and 1,500 feet in length. As soon as the clay is placed in the cars there is no more handling of the material as the cars are run direct to the crusher. The company will mine its own coal for fuel purposes and this will be handled in the same manner, conveyors being installed for placing the coal in the boiler house. Two veins of clay, one four feet of hard and the other three feet of soft clay, are controlled by the company. The coal vein averages about 3½ feet in thickness. At present the company has four kilns of the twin down draft type but preparations are now being made to add 10 more in the near future. An electric light plant is to be erected within a short time to light the works and to furnish light to the nearby houses.

The company is composed of C. F. Barclay, president; B. F. Geary, secretary; Josiah Howard, treasurer; and W.W. Wikel, superintendent. All kinds of brick for blast furnaces, rolling mills, coke ovens, etc., will be made the brands to be known as "W. B. Steel," "W. B. Crown" and "Bar Clay."

The conference between officials of the Republic Iron & Steel Company and the conference committee of the Amalgamated Association of Iron, Steel & Tin Workers resulted in the Republic company accepting the same class of continuous scale as was recently extended to the American Sheet Steel Company, to run until July, 1903.

The Open Hearth Tonnage.

The American Iron & Steel Association reports that the total production of open hearth steel in the United States in 1901, including direct steel castings, was 4,656,309 gross tons, against 3,3[illegible]-135 tons in 1900. The production of open hearth steel has more than doubled in the last few years having increased from 2,230,292 tons in 1[illegible] [to] the figures given for 1901. The production of open hearth steel ingots and castings by states in 1901, is: New England, 170,976 gross tons; New York and New Jersey, 92,985; Pennsylvania, 3,594,763; Ohio, 184,943; Illinois, 398,[illegible]; other states, 224,220. A grand total of 4,65[6],309.

The open hearth steel made in 1901 was produced by 90 works in 14 states—Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, New Jersey, Delaware, Tennessee, Alabama, Ohio, Indiana, Illinois, Wisconsin and Missouri. Neither Maryland, Kentucky, Michigan nor Minnesota produced open hearth steel in 1901, although all four states were producers in 1900. Rhode Island made open hearth steel for the first time in 1901.

In 1900 the production of open hearth steel by the basic process amounted to 2,545,091 tons and by the acid process to 843,044 tons. In 1901, 3,61[illegible]-993 tons were made by the basic process and 1,037,316 tons were made by the acid process.

Pittsburg's Exports.

Mills in Pittsburg and vicinity shipped through Eastern seaboard points last month over 6,300 tons of wire, nails and pipe to foreign countries. The wire shipments, which were made from the American Steel & Wire Company's plants, aggregated 2,712 tons. The United Kingdom, South Africa and South America were the largest purchasers. Consignments also were forwarded to Mexico, Australia, British India, Russia, Cuba, Holland and Sweden. The wire nails shipped amounted to some 1,700 tons. The pipe exports from the National Tube Company's McKeesport plant represented a total of 1,861 tons last month. Europe, South Africa, South America, Dutch East Indies and Australia were the principal countries to which shipments were sent.

The Uneeda Brewing Company has begun work on its new plant, Thiry-first street, Wheeling.

Jameson & Spear have begun the organization of a company at Salem, W. Va., to build a large electric light plant furnishing street and commercial lighting.

Ball Engine Company Enlarging.

F. Felkel, the engineer and architect of this city, has prepared the general plans for the new plant of the Ball Engine Company, Erie, Pa. and detail plans for its machine shop which i to be 136 feet x 200 feet with power building 60 feet x 80 feet. The design for this machine shop, for which bids are taken at present, shows some interesting original features, as this has been the case with all plants large or small, designed by Mr. Felkel—beginning with the mammoth plant of the Walker Manufacturing Company, in Cleveland, O., built in 1890, up to the plant of the Southern Engine & Boiler Works, in Jackson, Tenn., under construction at present.

The accepted plan of the Ball Engine Company shows an erecting shop 76 feet x 200 feet, 44 feet 2 inches high up to lower chord of roof truss with 30 ton traveling crane. Two buildings 60 feet wide are located at both sides. As the length of the main building runs from South to North, the roof in the shape of saw tooths recommended itself as the most appropriate design for these side buildings, turning the steep, or vertical side of the saw tooth North, thus securing the most desirable North light for all tool work. Five-ton cranes in side buildings have been arranged to run under those saw-tooth roofs at right angles to crane of main span, which arrangement is considered to comply best with the most modern machine shop practice, and is said to be far preferable to cranes in sheds running parallel with the principal crane. This idea has been advanced, supported with good reasons, by Mr. Armstrong, the superintendent of the Ball Engine Company. There are no posts inside of the buildings, except those carrying the main crane-runway.

This called for special design of the structural steel work and the "girder system" similar to that devised by Mr. Felkel, for the foundry of the Van-Wagoner and Williams Hardware Company, Cleveland, O., built in 1892, has been adopted. The building is designed for extensions in three directions, limited on the fourth side by a street. The steep roofs call for hard burned tile, roof laid upon a special arranged system of steel purlins, which saves tonnage and offers a perfect surface for the support of slate or tile roofs. Mr. Felkel devised his system first in 1892 for the buildings of the Lake Erie Engineering Works, now operated by the Allis-Chalmers Company, Buffalo, N. Y.

The elevations of the machine shop of the Ball Engine Company, show also some architectural features, which is in line with the modern tendency in designing industrial works as such plants have come to be considered more or less public buildings where a great many people congregate daily, where many spend the larger part of their lives; a moderate expense, therefore seems to be well justified to give such concerns a fair appearance.

While making the plans, Mr. Felkel also submitted a design for a large machine shop on the "multiple-cross plan" which American parlance would probably call "fish-bone style" of which we have seen a blueprint. That design is remarkable for its 40-foot bays, few inside columns, the coupled cross-cranes runways, suspended by roof girders, surplus of light and other features of good engineering and construction.

Heavy Tonnage Furnaces.

Plans have been prepared by the Carnegie Company's engineers for two new furnaces to be built at the Edgar Thomson steel plant in Braddock. The plans have been sent to the New York offices of the United States Steel Corporation for approval by the board of directors, which met there April 16.

The plans call for two furnaces with 90-foot stacks, with a capacity of 800 tons every 24 hours. The new furnaces are to be built just West of the present furnaces of the plant and will be known as "J" and "K," the furnaces at the Edgar Thomson plant being named by letters of the alphabet. There are nine furnaces already connected with the Edgar Thomson plant.

The blast furnaces built by the company at Duquesne had 110-foot stacks and were to produce 900 tons each 24 hours. It is said they never fulfilled requirements, and that better results are obtained from a 90-foot stack. Furnace "E" of the Edgar Thomson plant holds the world's record. or output of iron.

Enlargements of the foundry at the plant necessitate the new furnace, which are to be thoroughly modern in every particular. It is planned to rush work on them, and instead of using the usual time of 10 months in the building, to have these ready for work in just half the time, or five months.

National Metal Trades Officers—At the fourth annual convention of the National Metal Trades association of the United States at the Grand Hotel, Cincinnati, the following officers were elected for the ensuing year:

President, S. W. Watkins, Milwaukee, first vice president, E. F. DuBrul, Cincinnati; second vice-president, E. H. Bullard, Bridgeport, Conn.; treasurer B. Payne, Elmira, N. Y.: commissioner and secretary, Victor H. Olmsted, New York, re-elected.

Ore Situation at Cleveland.

The demands of the vessel men for 60 cents in Escanaba ore is not so strenuous as it has been. A few are holding out for the higher rate, and not getting it, are sending their boats for grain. There were a few boats on the market last week, however, for the lower priced ore, but the shippers were not able to take care of them. The fact is that the shippers are not nearly so ready to move the ore as they thought they were. The receipts at the upper lake ports from the mines are not up to expectations and the handling from the stock piles is slow. In consequence more wild boats are offered than can be cared for. All told, the early opening of navigation has not been so successful as it was generally supposed it would be. The start might have been delayed ten days without injury to any interest and with far more satisfaction to the trust fleet, as is evidenced by the number of disasters reported to date.

As To Law In Coal.

Last week at Cincinnati the United States Circuit Court of Appeals rendered a flat decision on trust methods as exemplified by certain coal companies, declaring suppression of trade illegal. The Court of Appeals holds that the agreement entered into by the various coal mine operators in the Kanawha, W. Va., district was formed for the purpose of controlling the selling price of the output of the mines. In the opinion Judge Day says:

"It would be closing our eyes to the situation, and the terms of the contract not to perceive that the limiting of competition was a moving purpose in entering into this agreement. Not only are the 14 operators who signed the agreement limited in price, trade and production to the governing action of the Executive Committee, but in the nineteenthh paragraph of the contract it is provided that any person, firm or corporation now or hereafter producing coal to be shipped on the C. & O. Railroad may become a part of the contract. It is to be remembered that it is the effect of the contract upon interstate commerce, not the intention of the parties into it, which determines whether it falls within the prohibition of the statute. It is not required that in order to violate this statute that a monopoly be created—it is sufficient if that be the necessary tendency or the agreement."

Ground has been broken at the Wheatland mill of the Continental Iron Company for new heating furnace and finishing mill. Reports of an open-hearth steel plant and other improvements have been confirmed.

Shafting Prices Advancing.

A meeting of the executive commitee of the National Association of Shafting Makers of America was held April 9, at the offices of Jones & Laughlins. Another session was held in the afternoon at the Hotel Lincoln. Those present were S. E. Bliss and George A. Cragin, of Chicago; W. J. Sampson, T. E. Davey, and Harry Bonnell, of Youngstwn, O., and George D. Harroun, of St. Louis.

This association is composed of the leading cold-rolled shafting manufacturers of the United States, and is incorporated. Jones & Laughlins, limited, of Pittsburg, are the largest manufacturers of cold rolled shafting in the United States, and those at the meeting stated that the conference had no significance except to discuss conditions of trade. It was announced that a 10 per cent increase in the list prices had been decided upon meet the advance cost of raw material. Trade was reported in good shape, and all the plants in operation, with orders on the books to keep them running steady for several months.

Reported Crane Combination.

Advices from New York city are to the effect that a number of crane building interests are to be consolidated under the name of the United States Crane Company. The dispatch states that firms located in New York, Cleveland, Muskegon Mich., and others are included in the deal, which will soon be consumated. The capital stock of the new company is to be placed at $100,000 later to be increased to $25,000,000.

A. E. Brown, vice-president and general manager of the Brown Hoisting Machinery Company, Cleveland, is quoted as stating that so far as he is aware there is nothing in the report. Others supposed to be connected with the new organization were unable to give any definite information.

Purifying Plants Installed.

The William B. Scaife & Sons Company, this city, has contracted to install water purification and softening plants for the following named companies:

National Mining Company, this city, 1,000 horse power; Harrisburg Rolling Mill Company, Harrisburg, Pa., 1,500 horse power; Isaac Harter & Company, Fostoria, O., 1,000 horse power: Antrim Iron Works, Mancelona, Mich., 1,500 horse power; A. A. Simands & Son, Dayton, O., 200 horse power.

Get Their Own Coal—The absorption of the)ominion Coal Company by the Dminion Iron ; Steel Company was arranged April 14. The teel company takes over all the properties and ssets of the coal company, guaranteeing the hareholders 8 per cent upon a capitalization of 20,000,000. The common stock of the coal com-ıany stands at $15,000,000, but it has some bonds ınd preferred stock outstanding, and the leases ırovided that these bonds and stocks shall be etired by the issue to the holders of $5,000,000 f the common stock of the company at 120, naking the total capital stock issue of the coal ompany upon which the steel company is to ay 8 per cent $20,000,000. The directors of he steel company decided to issue $5,000,000 of ew stock and to offer it at 60 cents on the dollar ro rata to the present holders of the company's ommon stock. This issue has been under-ritten by a syndicate of Canadian and American apitalists.

TRAVEL LIKE PRINCES.

Those who saw the special train in which H. R. H. Prince Henry of Prussia made his tour of the United Sates are comparing it with other trains in regular service, and it is admitted that none of the cars in the train compare favorably with the buffet, compartment and standard sleeping cars of the Pioneer Limited trains of the Chicago, Milwaukee and St. Paul Railway in daily service between Chicago, St. Paul and Minneapolis. The people of this country have the satisfaction of knowing that at any time they can not only travel like Princes, but can get much better service.

Patents.

The following patents granted April 8 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Steam engine governor, J. B. Allfree, Indianpolis; oil filtering and lubricating apparatus same; piston guiding and packing device, same; engine reversing mechanism, same; rotary engine, F. G. Bates, Philadelphia; grate bar for forced blast furnace. Franz Berger and H. M. Williams, Ft. Wayne, Ind.; manufacture of armor plate, Georges Charpy, Montlucon, France; rotary cylinder pump, Robert Richardson, Glasgow, Scotland; rotary engine, J. P. Shepard, Pennsboro W. Va., smoke consumer, L. E. C. Brushaber, Brooklyn, N. Y.; rotary piston engine, Josiah Dow, Philadelphia; metallic wheel, G. H. Everson, Pittsburg; smoke preventer, J. H. Hobart, Denver: steam or fluid pressure engine, W. J. Emmitt, Columbus, Ohio; dash pot, W. A. Heywood, of Philadelphia: steam engine, B. P. Whitney, Walpole, Mass.; furnace for producing wrought iron or steel direct from ore Edward Meininghaus, Dusseldorf, Germany; blast furnace, G. P. Herrick, New York; tuyer for cupola furnaces, Stewart Watt and R. H. Watt, Barnesville, O; steamtrap, George Moffat, Philadelphia; sand molding apparatus, S. J. Adams, Pittsburg, assignor to M. C. Adams, same place; method of forming sand molds, same (2); rotary engine, W. H. Dougherty, New York; lift mechanism for dipping tin plate, J. F. Fawcett, Pittsburg; speed regulator for explosive engines, J. S. Klein, Oil City, Pa.; air compressor, F. L. Reeder and A. B. Freville, Louisville, Ky., assignors to National Foundry & Machine Company, same place.

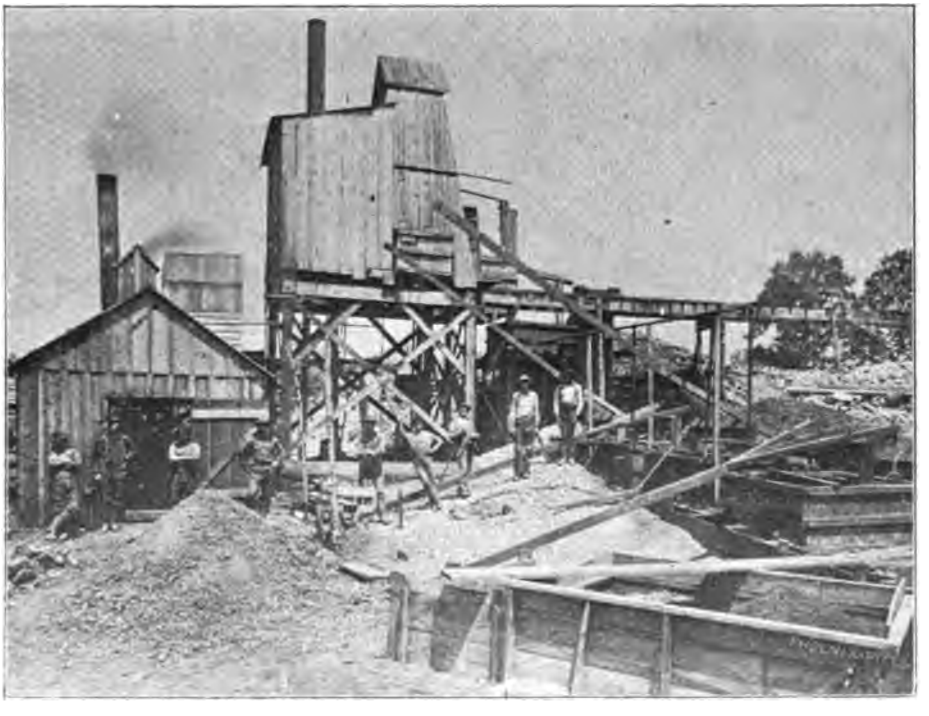
The first work on a new 600-ton blast furnace to be erected by the National Steel Company, at New Castle, was begun last week. The contract for the greater part of the new stack has been let to the Pennsylvania Engineering Works, New Castle, who will furnish the columns, foundation jackets, hearth jackets, stacks, column plates, and various other equipment used in the erection of the furnace. Other portions of the work will be done by William B. Pollock & Company, Youngstown, the United States Casting Machine Company, Pittsburg, and Riter & Conley, Pittsburg. The National Steel Company would like to have the new stack completed by November 1, and the work will be rushed as fast as possible to that end.

New Blast Furnace Work—The new blast furnace plant of the LaFollette Coal & Iron Company, La Follette, Tenn., is about completed and will be started up this month. The furnace will be about 15 per cent larger than any other furnace in the South, having a rated capacity of 500 tons. The furnace was designed and constructed by Walter Kennedy, of Pittsburg. Mr. Kennedy has also just completed a 175 ton furnace for the Roane Iron Company, Rockwood, Tenn., which will be started this month; a large furnace for the Woodward Iron Company, Woodward, Ala.; and is working on a second one for the Woodward Company, which will be ready for operation in July. Mr. Kennedy has completed plans for another large furnace to be erected in the South. The furnaces are all fitted with the "Kennedy" top-filler.

AMERICAN ZINC PRODUCTION.

BY WALDON FAWCETT.

NO branch of the American mining industry has witnessed more rapid dev lopment during the past few years than the production of zinc ore. From the position of a producer of barely one-eighth of the world's supply of zinc the United States has progressed until she is now turning out fully one-fourth of the aggregate output of the zinc mines of the globe. The principal sources of zinc ore production in the United States are found in what is known as the Joplin district, in Missouri and Kansas, and in mines located in the states of New Jersey, Colorado, Wisconsin, Iowa, Tennessee, Arkansas, New Mexico and Virginia. The production of the ore in Virginia has fallen off of late years owing to difficulties in mining which



Key West Zinc Mine Near Joplin, Mo., Showing Hand Jigs Commonly Used There.

have presented themselves and, on the other hand there has as yet been no opportunity for the demonstration of the real capabilities of the Arkansas mines owing to the handicap of inadequate railroad facilities, but there is every likelihood that this obstacle to increased production in the last mentioned section will shortly be removed.

The governmental statistics bearing upon zinc production which are collected from year to year are not particularly satisfactory to the student of the mining activities alone, from the fact that they concern themselves almost exclusively with the production of spelter, and as is well-known, zinc ore is, in many instances, transported for a considerable distance from the mines where a reduction to metal is made. However there are available fairly complete statistics covering the Joplin district and these are particularly interesting by reason of the fact that this expanse of territory in Southwest Missouri and Southeast Kansas constitutes the greatest zinc pro-

ducing district in the world and the further circumstance that its development has in point of rapidity few parallels in mining history.

The most remarkable gains in production in the Joplin district were made during the closing half decade of the old century. In the year 1895 the aggregate production of zinc ore in the district was 144,487 tons and there was a steady increase until 1899 when maximum production was attained with an output of 255,088 tons. The closing year of the old century witnessed a slight falling off in production although the output was in excess of any previous year save 1899 and the 1901 production of 13,000 carloads of ore was the second largest on record. The territory popularly designated as the Joplin district is a part of what is known as the Ozark region, various parts of which are rich in zinc deposits. The Ozark region embraces the Southern half of

Famous John Jackson Mine, Near Joplin, Mo., Showing $10,000 Worth of Zinc Ore in the Bins.

the state of Missouri, a small portion of Southeastern. Kansas, the Northeastern corner of Indian Territory and the Northern part of Arkansas. To express its limitations in nutshell form it may be said that it is bounded on the North and East by the Mississippi and Missouri rivers, and on the West and South by the Grand and Arkansas rivers.

The Joplin section which ranks preeminent as a producer of zinc ore is within the confines of extreme Southwest Missouri and Southeast Ka sas. Within the limits of this district is mined nine-tenths of the zinc ore secured in the United States or about one-fifth of the world's production. Although the zinc mines in this locality yielded more than $60,000,000 worth of ore during the last quarter of the century, it was only during the closing five years that the mining industry there attracted international attention. For years prior to that time mining was carried on in a cheap

and desultory way and in many parts of the districts the most primitive methods were followed. The profits of the industry in this territory may be readily imagined from the fact that whereas "jack" has at times sold as high as $55 a ton, the cost of the production of zinc ore in the Joplin district is under $14 a ton, and in a number of localites the ore can be mined, cleaned and made ready for market at an aggregate expenditure of $10 a ton.

A large portion of the mining lands in the Joplin disrtict are leased on the basis of ten per cent royalty, the property holder in many instances assuming the responsibility for the maintainance of a pumping plant for facilitating drainage. Most of the lands overlying zinc deposits is, to all appearances, ordinary agricultural land, some portions being covered with timber and the remainder being open prairie. Ordinarily zinc is found at a depth of from 50 to 150 feet. In some instances the ore body or "run" extends over several acres and has perhaps an average thickness of about one hundred feet while in other cases the deposits are in the form of small pockets. Much of the zinc obtained in the Joplin district mines is chemically pure, containing in the neighborhood of 67 per cent of metal zinc and 33 per cent sulphur. The resources of the district appear to be almost unlimited. Deep drilling has shown that beyond the 400 foot level there are immense deposits as yet untouched which far surpass in extent those in the shallower workings where operations have thus far been prosecuted.

Of late there has been a notable improvement in railroad facilities in the Joplin district and this improvement has worked to the advantage of the mine operators in a double sense by facilitating the exportation of considerable quantities of zinc ore to Belgium and other countries, a step which the mine owners were induced to take in order to circumvent the smelters who showed a disposition to fix their own prices for ore. An influential factor in the development of this district has been found in the inter-urban electric railroad which connects the cities of Joplin, Carthage, Webb City, Carterville, Prosperity and Blendville, Missouri; and Galena and Empire, Kansas.

In many instances the negotiations looking to the barter and sale of zinc ore at the Joplin district mines are of a nature dissimilar to those practiced in other mining communities. Under the old system—still in vogue to some extent—the ore instead of being turned over direct from mine owner to smelter was produced at the mine by "jack buyers," representing American and European smelters. These buyers based their offers for ore on personal inspection and made daily tours to the different mines for the purpose of looking at the output. Of course, the buyer always offered a price well below his most conservative private estimate of the real value of the ore in order to guard against any hidden deficiencies. The mine owner was almost invariably under the virtual necessity of accepting without question the price offered, for the "jack buyers" seldom encroached upon each other's territory and there was consequently no competition. The buyer made out his check for the ore purchased to the owner of the land and that individual, after deducting the royalty due him, turned over the balance to the operator.

However, with the rise in the price of ores and the imposition of various exactions which followed the organization of the Missouri and Kansas Zinc Miners' Association three years ago, there came a change and ore is now purchased largely upon assay. The buyers in the Joplin district now follow the rule of deducting 50 cents per ton for each per cent of lead present in zinc ore, and one dollar a ton for each per cent of metallic ore the ore contains in excess of one per cent. The board of directors of the Missouri-Kansas Zinc Miners' Association—which is in reality a mine owners' combine set up to combat a smelters' combine—now undertakes to each week fix a minimum price for ore based on the price of spelter and the assay value of the ore. This organization has during its brief existence given several forceful demonstrations of the value of protective co-operation, the most significant being, of course, the action in securing the agreement of a large number of the largest producers of zinc ore for the regular weekly exportation of one-fourth of their output to Europe, an action which prevented the accumulation of a surplus supply of ore in this country, and has had a very appreciable effect in advancing and maintaining prices at all times since the compact went into effect.

Of late there have been indications that the pre-eminence of the Joplin district may be threatened in the near future by other sections whose ore has heretofore been inaccessible owing to lack of transportation facilites. The acknowledgedly rich deposits in Arkansas afford a case in point and another is offered by the zinc deposits at Leadville and esewhere in Colorado. The richest zinc mines in the Eastern part of the country are those at Stirling Hill and Franklin Furnace, in Northern New Jersey. The ore assays only about one-quarter zinc but the deposit is one of the greatest in the world. The cost of opening and equipping a zinc mine varies greatly, of course, in different sections of the country, but in the Joplin district an investment of $10,000 or $15,000 for this purpose is by no means unusual. That there is such profit in the production of ore in the Joplin district is due to the low cost of mining and milling. There are cases on record where great quantities of ore have been milled at from 20 to 30 cents a ton, or mined at 60 cents a ton.

Interlocking Sheet Steel Coffer-Dam.

LAST week the members of the Western Society of Engineers were invited to inspect a new form of coffer-dam, constructed of I-beams, channels and bolts, that is being used in making excavation for the abutments of a new bridge across the Chicago river at Randolph street, Chicago. The construction of the coffer dam, which is after patents of A. Simon, of Germany, and George W. Jackson, of Chicago, is very simple, as will be seen from the arrangement of the parts as shown in Fig 1. Two channels are bolted together face to face, the bolts being just near enough to the flange to permit the flange of an I-beam to interlock with the flanges of the two channels. The steel sheeting or coffer-dam is extended by driving first an I-beam and then two channels, and then an I-beam, and soon around until the site is enclosed. The pieces are put down with a pile driver in the ordinary way that wooden sheet piling is driven. It is made water-tight by tamping with clay the space enclosed between each two channels and the flanges of the I-beams with which they interlock.

Fig. 2.—Inter-locking Sheet Steel Coffer Dam.

The sheeting that is being used at the bridge named is 40 feet long, and is driven so that the top stands only two or three feet out of water, as illustrated in Fig. 2, which shows the outer side of the cofferdam. Fig. 2 shows the bank side of the coffer-dam and the interior bracing. One reason for bracing so heavily was the proximity of the work to the foundations of a five story building. After the work is completed the steel members will be pulled out.

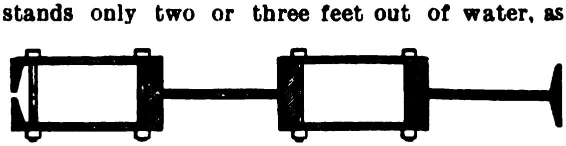
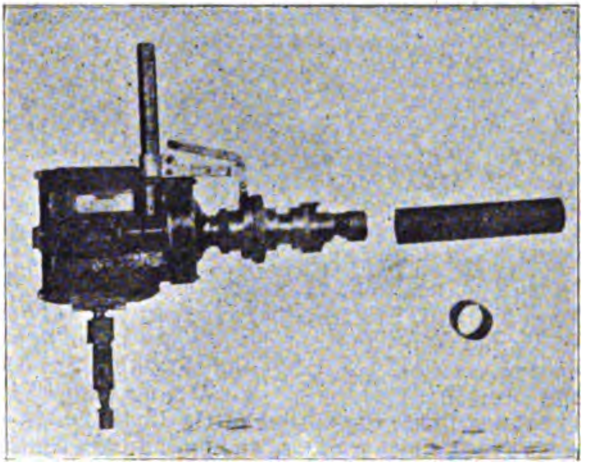


Fig. 1 Shows Section of Sheet Steel Coffer Dam.

Economical Flue Cutter.

THE accompanying engraving show a convenient pneumatic flue cutter designed in the Minneapolis shops of the Minneapolis & St Louis Railroad about a year ago, and which has been in continual service since that time showing but slight wear. The flue cutter is eight inches in length, attached to a pneumatic motor such as is usually used for boiler work, and operated by one man. With it all the flues in a boiler may be cut without removing the front end door and rings. It is not necessary to suspend the motor in any way as it is very light and one man has no difficulty in handling it. The cut shows a view of the flue cutter attached to the air motor and a short length of flue which has been cut with the device.

During the last four months the flues have been cut out of 15 Mogul engines at the above shop and only 1 hour and 20 minutes to one hour and 40 minutes time has been required to do the work. Each of these engines contain 16 flues two inches in diameter, 11 gauge, which had been in service two years. On the standard engines of the Minneapolis & St. Louis road—engines with 17-inch cylinders, and having 150 to 190 flues from 35 to 40 minutes time is required to cut all the flues. The latter are cut at the same distance from the flue sheet and the tips can be welded on the same ends. Illustrating the economy of this tool it may be mentioned that if 316 flues were cut by hand with the rub bar about 15 hours' time would be necessary, and then would have to be machined on the ragged ends before the tips could be welded. By this method the cost of cutting flues in the shop before mentioned amounts to $2.55, while performing the same operation by means of the flue cutter here illustrated, the expense for labor is but 30 cents.



An Economical Flue Cutter.

The tool is made entirely of steel and is all straight turning, and there are no gears in connection with it. The mechanism feeds automatically and also has a friction feeding device which is operated by a handle alongside the air-motor handle, as shown in cut which may be very conveniently held by the operator. While the motor is in operation the flue cutter will cut the flue off in practically an automatic manner. The friction feed is applied if it is desired to hasten the job and by this means it is possible to cut a flue in five turns of the motor. After the flue is cut the cutter can be thrown out of engagement by a reversible motor, and in case the motor runs in one direction only, it can be done by hand by turning the knurled part of the flue-cutter one-quarter revolution ahead.

Mr. J. C. Hicks, machine shop foreman of the Minneapolis & St. Louis Rrailroad Shops, supplied the photograph from which the accompanying illustration was prepared, together with the details in connection with the cutter. He has stated the following as a result of a test made quite recently to determine how many flues could be cut per minute with the device. On the occasion of the trial 9 flues were cut in one minute on the extreme outer edge of the flue sheet where it is very difficult to handle the machine, and in the center of the sheet 15 per minute were cut very rapidly. An expert mechanic is not necessary to operate the tool, and in this way it is possible to have that class of work performed by inexpensive labor.

ROLLING METAL DIRECT.

BY WILLIAM GARRETT.

A FEW weeks ago one of the trade papers contained a lengthy and elaborate article on rolling metal from its liquid state. The description as to how it should be done was very clear—the different temperatures given for the various stages—illustrations from several points of view were shown, and it was stated that even Mr. Bessemer had conceived this idea and thought it feasible. A Mr. Norton, of Chicago, was mentioned in connection with this, though very briefly; still past history will prove that no one in this country or in the world had done more to develop metal rolling than Mr. Norton, and if the writer is not mistaken they are still rolling liquid spelter into solid strips to be used in the manufacture of tin cans.

In addition to what was described in the published article and the above, the writer has come across several people who believed they had solved the problem of handling the liquid metal to a marketable shape in a direct way. One method was to have a large cylinder with a close fitting piston. At one end of the cylinder was placed a 4-inch round outlet, which out-let projected from the cylinder a certain length and was reinforced. A plug was first driven from the out-side of this out-let and the metal was poured in; then, at a certain stage the piston was slowly put into motion and the plug removed. It was intended that by forcing the metal through the 4-inch round hole the entire quantity would come out in the shape of a long 4 inch billet, which was then to be cut a certain length and into the given weight required. However, this, like Bessemer's idea on the same subject, and Mr. Vollkommer's, who wrote the article referred to, was never developed. Another grand idea was once presented to the writer and this in a sober, dead earnest way. This was to have the metal in a blast furnace suitable for wire rods, pierce a hole from the outside of the furnace near the bottom of the liquid metal. If No. 5 rods were wanted the idea was to bore a hole that size and have a trough with a groove in the bottom the same size, carry this throughout or just as far as desired to solidify the metal, then attach to a reel and you have a No.5 rod direct from the blast furnace. While this is not accompanied by drawings, "figures No. 1,2.3, etc.," nor the speed of the metal coming out from the blast furnace given, nor the temperature of analogous cases, it is an idea all the same. As to which is the most feasible, the methods above described or those referred to in the latest article readers must judge for themselves. The problem of the rolling of liquid metal is most interesting and the object to be obtained very desirable one. Fancy being able to produce rails, beams, channels, merchant bars of all sizes, tin plate sheets, wire rods (why not wire?) direct from the metal without blooming mills, rod mills and the expensive finishing mills required at the present time. When this problem is solved it will be possible for the general manager of the mill to touch a button, telephone up to the melting shop and order one hundred thousand gallons of steel 85 pound per yard rails to be delivered at once, then fifty thousand gallons of 90 pound rails, so many gallons of steel into girders, so many into certain sized channels, etc. Our methods of weights and measures will have to be revised and a complete revolution in the steel business will take place.

The writer at a certain period in his life contracted the liquid metal rolling fever and visited Mr. Norton in Chicago, who, as claimed above has done more in this line than any other living man and who did not go outside to get money to make his experiments but spent his own money. After quite a conservation wherein he related the many difficulties he had encountered, and he spoke as if he still had faith in the success of the method, he went to his safe and from an inner recess, where a man generally keeps articles of great value, he brought a cup of not a very artistic finish. The edges of this cup were irregular and it had no handle, by no

means a three-handled loving cup, but just a plain handle-less mug, had no fancy engraving, was not silver plated and looked as if it were made from plain sheet steel about 1-16 inch thick. Handing it to me he said, "I would not part with that cup for $35,000." Upon my remarking that perhaps it had cost that much, he replied, "That is just about what it did cost me." I think this is about the most complete article ever produced from the rolling of liquid metal and I claim that no one, Mr. Bessemer included, has done more to develop the method of producing steel into a finished state than Mr. E. Norton, of Chicago, who, while not teaching us many things to do in this direction, taught us a great many things not to do.

French Shipping Bounties and American Coal—The Colliery Guardian, London, says, editorially: Whatever opinions may be entertained as to its commercial sanity, one cannot but regard the new French Bounty Law as capable of incalculable injury to our coal export trade. Under this bill the French Government will devote 200,000,000 francs during the next ten years to the nurturing of its mercantile marine. Foreign-built vessels already owned in France are refused a bounty, but vessels built abroad in the future will enjoy a bounty rather less than a third of that allowed to vessels built and owned in France. The latter will receive 1 franc 70 c. per gross ton per 1,000 miles (compared with 1 franc 10 c. under the law of 1893) run for the first year, with decreases with each succeeding year, on steamers over 3,000 tons, of 1 c. per 100 tons, up to 7,000 tons, where the progressive character of the reduction terminates. The danger to our coal trade lies in the fact that the bounty-picker will find a trip to Baltimore or Newport News far more remunerative than a visit to the Tyne or Bristol Channel, although he is by no means a stranger in either of the latter strongholds of British shipping. That there are those, both in France and in the United States, who are not blind to this is disclosed by a report recently sent to his government by the United States Consul at Havre. After describing the provisions of the new law, he says, in giving an example showing the benefits which a French-built steamer of 7,000 tons gross(not belonging to a regular subsidized mail line) engaged in carrying coal or other merchandise between New York and Havre, would derive from it:—

The official distance between Havre and New York upon which the subsidy would be based is 3,171 miles; 7,000 tons at 1.50 francs per ton per 1,000 miles equals 10,500 francs ($2,026.50); distance between Havre and New York and return, 6,342 miles; 10,500 multiplied by 6,342 equals 66,591 francs ($12,852) deduct 11 per cent, 7,325 francs ($1,414); net bounty for the first year, 59,266 francs ($11,438). If the steamer left Havre without any cargo and returned from New York with 9,000 tons of coal, the bounty received by the owners of the vessel the first year would be equal to $1.27 per ton of coal.

The average bounty to steamers of from 3,000 to 7,000 tons for the first five years would be 1.42 francs) 27.4 cents); the average bounty for the second period of five years, 1.1 francs (21.25 cents); and for the third and last period 43 c. (8.29 cents). With this assistance from the government, owners of French built steamers will be in a position to enter into contracts with American coal shippers to transport coal to France and other countries at low rates. French capitalists are studying the question whether American coal, carried on subsidized French steamers, could not be delivered in France and other European countries at such prices as would enable it to enter into successful competition with British and other coal. With this end in view one syndicate has already sent a representative to the United States to confer with colliery proprietors, coal shippers, and others interested."

We note that small consignments of coal are being taken from New York to Genoa at a freight of 5s. 6d. at the present moment. A British export duty, a French shipping bounty, and a possible American ship subsidy in conjunction constitute a big handicap on British coal. Who knows but that an international shipping bounty conference may not be as necessary as that on sugar bounties, and not in behalf of our colonies, but on behalf of ourselves?

ELECTRIC CRANES AT MIDDLESBOROUGH DOCKS.

BY FRANK C. PERKINS.

ELECTRICAL installations in marine enigneering are becoming more important each year, and in Engand as in America, complete equipments of electrical appliances for cargo handling at docks are being used with success. The electric cranes and capstans as well as other electric cargo appliances which have recently been installed at the North Eastern Railway Company's Middlesborough (Eng.)docks have many points of interest.

The central power station consists of four Bellis-Siemens generating sets; three capable of handling the entire installation, the fourth being installed as a reserve. The engines are of the Bellis & Morcom three crank compound high speed double acting engines, directly coupled to Messrs. Siemens Brothers & Company's two pole direct current dynamos each having a capacity of 240 kilowatts. These engines drive the generators at 380 revolutions per minute, the current being supplied to the distribution circuits at from 400 to 430 volts pressure. The boiler plant consists of four Lancashire boilers fitted with Procter's' stokers, the boilers being constructed by Messrs. Danks & Company. Green economizers are employed and two of Watsons' single cylinder pumps are used for supplying the necessary feed water. A complete surface condensing plant was installed at this power station.

The switchboard installed at this plant is constructed of marble and consists of four machine and one feeder panel. The instruments are of the Siemens Brothers moving coil type. Each generator has its shunt winding brought to a switch on the board and these shunt switches are interlocked with their respective main switches so that it is impossible to break the exciting current of any machine until the armature has been cut out of circuit; and it is also arranged that the armature cannot be thrown into circuit until the shunt circuit is made.

The shunt circuits are excited from the bus bars and the four machines are run in parallel on these bars. The feeder and distribution cables which are connected with the bus bars of this switchboard are all laid underground. These cables are lead sheathed and fibre insulated and they are placed in wooden troughs in a mixture of sand and tar about 24 inches below the surface of the ground. At the junctions of the feeders water tight junction boxes are placed. and crane connection boxes are provided, which are arranged in two parts, the bottom part containing the positive and negative distribution cables and the top part contains the fuses and connections for the cranes. Through the lower portion, the distributing cables pass, and by means of a T joint connections are made to the upper portion: and at the same time the nearest electric capstan is also connected A bituminous compound fills the lower part, keeping out all moisture, a water tight steel cap covering the box when it is not in use. The fuses and contacts are mounted upon porcelain insulators and are kept securely away from all rain and weather, as it will be seen that the top of the box consists of a chequered plate with a circular aperture which receives the connection socket, the steel cap keeping the connections dry when the socket is not in place. These connection boxes have stood the test of the severest weather and they are placed about 60 feet apart; there being more than 50 such boxes in all. The socket which connects this box with the crane consists of a circular gun metal hood, which fits the opening in the top of the connection box, it also being arranged to keep out the wet; and the interior of this hood contains two gun metal tongues which meet the two clips in the interior of the box. A stud and groove insures that the socket shall enter the aperture only in the right position. The flexible cable for the crane enters the hood of the socket through a trumpet mouth and the whole apparatus is so designed as to take up as little room as possible on the docks.

There are ten ten-ton cranes installed as well as seventeen three-ton cranes. These jib cranes and electric capstans were constructed by Cowans, Seldon & Company, limited, of Carlisle, the electric motors being of the Siemens enclosed iron clad

direct current types. The traveling speed of these electric jib cranes is 30 feet pe minute; and the revolving speed at hook is 400 feet per minute! The speed of lfting 1½ tons is 250 feet per minute and with 3 tons is 150 feet per minute. The height of the jib top tip from the quay level is 60 feet and the radius of the jib is 44 feet 9 inches. The crane is of the high gantry type; with gantry 30 feet high so constructed as to admit of the passage of wagons and engines underneath. On account of the large radius of the jib cranes, five lines of rails is covered and the delays from switching or shunting are thus made a minimum. The lifting motor is a 75 horse power machine operating at 300 revolutions per minute. It is of the multipolar enclosed type with series windings and laminated steel poles. The field coils are of copper strip and may be detached from the magnet cores with comparative ease. The insulation is tested to 2,000 volts and the automatic oil ring system of lubrication is employed.

A motor work, spur gear and worm wheel forms the revolving gear; the worm is solidly forged on the shaft, and is fitted with a coupling to meet the motor. The worm engages with a delta metal worm wheel, and a pinion keyed to the worm shaft engages with a spur wheel which is fitted to a short shaft actuating a pinion. This pinion travels round the rack of the crane and thus slues the cabin and jib, while a brake is fitted to the first motion spindle so that the slueing motion is always fully under control, the brake being actuated by a foot treadle. The motor for slueing is very similar to that used for lifting.

The jib is constructed of two channels with two flat bar bracings and has a cast iron bracket fitted at the bottom, though which the jib bottom pin passes and secures it to the crane framing, The stay rods are secured to the jib tops by a separate pin from that on which the jib to pulley runs. The crane controller is of the universal type, constisting of two separate controllers combined in one case and actuated by one lever or handle. One movement actuates the lifting motion and the other the slueing, both being connected by pinions and quadrants to the lever. The latter is to be arranged by this universal device that when moved in a vertical plane it actuates the lifting and when moved in a horizontal direction it operates the slueing controller. It will thus be seen that the load on the hook follows the motion of the operator's hand, lifting when he raises the lever and lowering when he moves his hand down. Inside of the cabin are placed the necessary resistances connected with the controllers; and the switchboard consists of polished slate, on which is mounted an automatic cutout, lifting and slueing isolating switches, as well as the necessary fuses and lighting switches. A cluster of electric lamps are placed in an enameled iron reflector beneath the jib and both fixed and portable electric lights are supplied in the cabin.

Twenty four electrically operated capstans are provided for handling the cars and are capable exerting a steady pull of one ton at a speed of 200 feet per minute or of hauling of a load of 100 tons along a level road. The capstan head is driven by a cast iron spur wheel which is engaged with a steel pinion, the latter being keyed on the same shaft as a brass worm wheel. The driving worm is forged solid upon its shaft an is coupled direct to the motor spindle; the worm and wheel working in an oil bath. An enclosed motor is used which operates at 1,000 revolutions per minute and is of the shunt wound type so as to avoid large variations in the speed of the capstan head.

There is an automatic mechanical brake upon the motor shaft so arranged that when the capstan head is driven by the motor the brake releases automatically but should the capstan tend to run back through being overhauled by the weight of the brake at once looks itself and sustains the load. It is necessary to have such a brake with an electric capstan as it differs from the hydraulic capstan in this way: the water in the cylinder holds the load whereas with the electric capstan there is nothing to sustain the load when the current is shut off, and if the load is allowed to run back a serious accident may result, and it must be automatic, as the brake should require no attention from the operator.

The electric capstan switch and controller is provided with a magnetic blow-out and overload release. It is operated by the foot by means of a pedal projecting about

4 inches above the capstan case: and a dash pot is provided which makes it impossible to operate it at too high a speed when starting the capstan; but the plunger of the controller is allowed to return quickly, as valves are provided in the plunder, and a weight falls which is lifted in starting as the pedal is depressed. If the capstan is pulled up by a sudden overload the release gear works instantaneously and breaks the main circuit.

A number of tests were made upon the three-ton cranes and it was noted that the electical energy consumed in one complete cycle of revolutions at full load is about 170 watt hours. With a three ton electric jib crane, a good operator can make 45 complete cycles of revolutions per hour; which consist of lifting three tons through 30 feet, slueing through 120 degrees; then lowering three tons 30 feet and hoisting light hook 30 feet, slueing back through 120 degrees at the same time lowering light hook 30 feet for the next load.

The bottom framing of the gantry of these cranes is composed of two channels, tied together by plates and riveted up so as to form an open box-shaped girder. The trod wheels are of cast steel with double flanges and keyed on steel spindles running in cast iron plummer blocks bushed with brass. Both hand and electric gear is arranged for the traveling gear motion. The electrical gear consists of an enclosed series wound multipolar motor which is coupled to a steel worm, working into a delta metal worm gear. The power is communicated to the rod wheels by means of spur and bevel gearing; the wheels on each side being coupled, together by means of a cross shaft, thereby insuring uniformity of movement and avoiding any twisting strain on the gantry. It takes about three minutes to release the rail clips and jacks, and travel 30 feet and again refix and jacks: this time including that necessary for removing and re-inserting the plug connection in the next box. The switch mechanism for the traveling motor is placed in a water tight case upon the bottom frame of the gantry, in order to provide against any one operating these switches without the proper authority; a key is used which is in charge of the operator and kept in the cabin.

Four compound steel girders are used for the uprights, set at an angle which gives the gantry the form of a pyramid; while the white structure is tied together and holding down clips for fixing to the rails are provided as well as screw-down jack for increasing the base when the maximum load is being handled; although these are quite unnecessary even with heavy overloads.

The top frames of these electric jib cranes are constructed of H beams riveted into box shape and carrying the heavy plate which takes the roller pathway. To stiffen the structure and take the thrust H beam cross stays are provided. The top plate is turned in a lathe to receive the roller plate, and is bored out to receive the center pin; while the latter is made hollow to allow of the main cables being taken through it in the crane cabin. The roller path and rack are of cast steel. They are not bolted to the top plate and while they are held down by a groove turned out of the latter, they admit of some movement and ease the crane in case of a sudden stop when revolving. Twenty four steel rollers are used. There are two H beams which are tied together forming the revolving frame and having a cast iron center piece through which the center pillar is taken and upon which is fitted a grooved steel ring provided with a series of hardened balls.

The device for collecting the current consists of two copper rings mounted upon abrroin and separated by rings of the same insulator and this collector is fitted to the pillar above referred to. The brushes which collect the current are two gauze straps, each of which encircles a ring the pressure being regulated by springs, and these straps are attached to terminals mounted upon porcelain insulators.

The controlling apparatus, as well as the lifting and slueing gear, is located in the cabin. The hoisting gear consists of a drum, wheel and pinion, and the latter which is of wrought steel, is forged solid on a shaft which is fitted with a half coupling to meet that upon the motor shaft; and upon this shaft there is a band brake which is operated by an electro-magnet. The wrought iron pinion gears into a cast iron spur wheel keved on the drum shaft; the pinion and wheel working in an enclosed bath of oil. The hoisting is accomplished by a single flexible wire rope, and the drum

is of cast iron and grooved to receive the rope; and of a diameter sufficient to take the full lift without overlapping.

It may be of interest to note the electric braking device used. The magnet for the electric brake is placed in series with the armature of the lifting motor and is of horse shoe shaped similar to a bipolar dynamo field magnet, with a solid steel armature revolving between the poles. The switching of the current through the field coils moves the armature a quarter of a run and as a lever is fixed to the end of the armature and connected with the brake which is normally held on the brake wheel by weight, the movement of the armature lifts the brake and releases the brake wheel. This form of brake magnet has a strong pull and a long range, and the brake works effectively. The brake may be operated by hand if desired.

NOTES FOR THE CHEMIST.

Determination of Phosphorus in Chilled Iron by Permanganate Oxidation—Manby. (Proc. Chem. Section, Engineers' Society of W. Penn'a.) The author refers to a paper by A. G. McKenna on "errors in phosphorus determination," which proves that the regular method gives lower results than are obtained after evaporation and baking. He claims to overcome this difficulty by annealing the sample and proceeds as follows: Two grams of the sample are heated in a platinum crucible, in an atmosphere of gas, for about two minutes at a bright red heat. Cool, transfer to a 500 c. c. flask, add 40 c. c. hot water and 15 c. c. strong nitric acid. After first action ceases add 10 c. c. hydrochloric acid. Digest on hot plate for five minutes, boil and add 10 c. c. saturated potas. permanganate solution. The manganese dioxide produced should re-dissolve in the hydrochloric acid present. If not clear in ten minutes add a few drops of the acid, or sodium nitrite solution (50 grams per liter.) Remove from plate, dilute and filter off any unoxidized graphite. Add excess of ammonia and re-dissolve in nitric acid. Solution should be about 100 c. c. in bulk. Heat to 90-95 degrees C. and precipitate with 70 c. c. moybdic acid solution. Shake at intervals and after 10 minutes filter and wash until free from iron or acid.

In titrating, the author uses water for dilution, which has been sensitized with alkali and phenolphtalein, the indicator also being sensitized by just enough alkali to produce a permanent pink color. After adding excess of alkali, shake solution until yellow precipitate is dissolved, titrate until pink is bleached, then add enough alkali to just restore the pink tint. Calculate as usual. Results compare well with those obtained after oxidation by evaporation to dryness.

Solubility of Barium Sulphate—G. S. Frops. (Am. Chem. Jour. Apr.02) The author describes exeriments made at the North Carolina Department of Agriculture by C. B. Williams. In solutions containing no excess of barium chloride or sulphuric acid, and with increasing amounts of ferric, aluminum and magnesium chlorides, the following results were obtained.

Grams per Liter of Fe Al. or Mg. Chlorides	Milligrams of $BaSo_4$ dissolved per liter. $Fe\,Cl_3$	$Al\,Cl_3$	$Mg\,Cl_2$
1	58	33	30
2½	72	43	30
5	115	60	33
10	123	94	33
25	150	116	50
50	160	170	50
100	170	175	50

Comparing these figures with results of Fresenius with other salts, the authors find that $BaSO_4$ is much less soluble in a 10 per cent solution of the above chlorides than in 10 per cent nitric or hydrochloric acids, or ammonia chloride solution, but it is less soluble in a 2½ per cent. solution of ammonium chloride.

In the presence of an excess of barium chloride, the following tests were made, using 400 c.c. solution. In each case sufficient sulphuric acid was added to form 5 milligrams of $BaSO_4$.

Ba Cl_2 Sol. (1-10)	Turbidity With Al Cl_3	With Fe Cl_3	Amount of Al Cl_3 and Fe Cl_3 in solution
7.5 c. c.	In 1 hour	In 24 hours	5 grams.
20.0 c. c.	In 1 hour	In 24 hour,	10 grams.
12.5 c. c.	In 48 hours	In 48 hours	25 grams.

Comparing these results with those of Fresenius the authors find that in the presence of barium chloride, $BaSO_4$ is less soluble in aluminum or iron chlorides than in a 10 per cent or a 2½ per cent solution of ammonia chloride or a 2½ per cent solution of sodium chloride, or nitric or hyhdrochloric acids.

Determination of Vanadium—D. T. Williams, (Jour. Soc. Chem. Ind. Vol. XXI, No. 6) For ores the details are as follows:—Take 1 or 2 grams of the sample (according to richness) and treat with 6 c. c. of nitric acid, after thorough decomposition evaporate to dryness, heat with 4 c. c. sulphuric acid until all nitric fumes are expelled, dilute with the water, and boil; filter off lead sulphate, oxidize filtrate with 4 c. c. nitric acid; boil well. If excess of acid should be used, make alkaline with ammonia and re-acidify with dilute sulphuric acid. Cool solution to about 40 degrees, C. and titrate with decinormal ferrous sulphate containing free sulphuric acid, using potas. ferricyanide as indicator. The yellow solution is changed to a bluish color, too faint to affect the indicator. The iron value of the ferrous sulphate solution, multiplied by 0.914=Vanadium.

$$V_2O_5+2Fe\ SO_4+H_2SO_4=V_2O_4+Fe_2(SO_4)_3+H_2O.$$

For vanadium-iron alloy, dissolve ½ gram in aqua regia or $HCl+KClO_3$, evaporate to dryness after adding 6-8 c. c. of sulphuric acid, heat until all nitric fumes are evolved and chlorides destroyed. Dilute with water, filter, oxidize with 6-8 c. c. nitric acid, boil well and titrate as above. As a check the reduced solution may be titrated back with N-10 or N-20 potas. permanganate, until afaint pink color remains for 20 or 30 seconds. This check generally runs a little high. The paper contains a number of tables giving results determined by above methods.

WARRANTY OF A MANUFACTURED ARTICLE.

EMANUEL T. BERGER.

IN connection with the law that has arisen through contracts and transactions between manufacturing companies and buyers, perhaps no question has been so fruitful of legal discussion as the question of warranty of a manufactured article. Perhaps it is not necessary to state that warranty means guranteeing an article to be of the proper quality, grade or proper workmanship, in accordance with order or in fulfillment of the intentions of the buyers. Warranty may be divided into two kinds namely, expressed warranty and implied warranty. The first class comprises stipulated and expressed written or oral guarantee of the quality or fitness of an article and it can be said that in nearly all cases where a manufactured article has been guaranteed to be of a certain quality or workmanship and such guaranty has been reduced to writing and made definite, that the sellers would under ordinary circumstances be held to a strict compliance with the provisions of his contract, and the only question that could arise in such a case would be a question of fact as to whether the article corresponds with the guarantee. Much of the discussion in cases of express warranty has arisen through a misinterpretation of the words leading to a guaranty, and as to just what words or expressions constituted a warranty depends upon each individual case. Ordinarily the clear intention of the parties will be held to govern and the words will be construed strictly or broadly as the intenton of the parties may seem to indicate. The greater class of warranties that have come up for adjudication in the courts of law, is that of the implied warranty. An implied warranty is a guarantee which is imposed upon the manufacturer or seller of an article although no written stipulations of guaranty have ever been entered into. They arise in cases where the seller is deemed to have guaranteed that an article sold upon sample is

equal to the sample, or that an article contracted for belongs to the seller in title and that he has a legal right to dispose of it, or that the goods will be of fit and merchantable quality and workmanship. Such warranties need not be expressly stipulated in writing and are imposed upon the seller because of the relation he stands to the buyer, in other words for good faith. A great many interesting cases have arisen under this subject. The principle of warranty of an article must not however be confounded with the principle of strict compliance with certain descriptions of an article in a contract; for instance, where a man orders a certain grade of goods and specifically describes these goods, stating their kind and quality, the manufacturer is held to a strict compliance with the description and his duty to comply with that description does not mean warranty. It merely means he has made a contract to supply a certain article and can, therefore, under the contract supply no other kind of goods.

A case of that kind arose in Maryland a few years ago which will perhaps be interesting. The Columbia Iron Works & Dry Dock Company, of Baltimore, Maryland, obtained a contract from the United States government to build two United States cruisers, "The Detroit" and the "Montgomery," at their yards in Baltimore. The plaintiff, George B. Douglas, of New York, contracted with the iron works Company to buy "from 125 to 175 tons of steel scrap. consisting of clippings and punchings from the steel plates and angles used in the construction of the United States cruisers at $16.50 per gross ton" and certain arrangements were also entered on at the same time for the payment thereof. After the work had progressed somewhat the iron company shipped Douglas 159 tons of what was supposed to be steel scrap and sent their invoice therefor, which was paid on demand. Without unloading the cars Douglas sold the steel to the Latrobe Steel Works, of Pennslyvania, but when the cars reached their latter destination it was found that instead of 159 tons of Cruiser steel they contained only 89 tons of cruiser steel and 70 tons of miscellaneous matter composed of light sheet iron borings, turnings, pipe and material of the like. These 70 tons were returned to Douglas and in consequence he was compelled to sell them at much less sum than he paid for them incurring considerable loss. Douglas thereupon notified the Iron Company of the matter and upon receiving no satisfaction began suit to recover for the loss sustained. The case went up to the Supreme Court of the state of Maryland and the judge there held, after reviewing the facts very carefully that the contract in question had stipulated for a certain quality of steel scrap, same being clippings and punchings from the steel plates and angles of the two cruisers being built, and that if any other material outside of that description had been included and shipped to Douglas under the guise of "cruiser steel" he could not be made to pay therefor and was entitled to any loss he sustained by having them forced upon him. The Iron Works & Dry Dock Company claimed as a defense that they were not bound to furnish iron and steel all of the cruiser quality inasmuch as they had not warranted the steel to be of that quality, nor was their any implied warranty that all the shipments were to be composed of this quality of steel. The court met this statement by holding that the contract was not one in which the question of warranty could arise inasmuch as the steel purchased was accurately and specifically described and that the sellers were bound to respect the description and could not force upon the buyer any thing outside of that. A specific identical thing was contracted for and the substitution of any other or different material, no matter what its quality might be, was a clear breach of the contract. On the other hand a warranty is an expressed or implied statement of something which the party undertakes, shall be a part of the contract and not the main object of the contract itself. The distinction therefore between what is a breach of a guarantee of quality and what is a breach in not complying with the strict terms of the contract must be drawn in all cases and the above case is the illustration of the latter class. Where a buyer contracts for peas and the seller sends him beans, there is a breach of contract, not a breach of warranty. It is merely that the seller failed to comply with the plain provision of the order and not that the failed to live up to a guarantee of quality of peas.

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EDITORIAL COMMENT.

What of the Scrap?—A question that has much interest for the steel-makers for the present and future is: Where are we to get enough scrap for open-hearth steel making? In view of the increase in the tonnage of open-hearth steel, the question takes an additional interest. A gain from 3,398,135 gross tons in 1900, to 4,656,309 in 1901, or 1,258,174 gross tons indicates a heavy increase in the consumption of scrap. It also indicates, as is revealed by the markets, that the accumulations of available scrap have been pretty well cleaned up, and hence we see old material bringing prices much higher than at the opening of 1901, with a scarcity at all accumulating points that presages still higher figures.

The great improvements prosecuted by substantially all the railway lines of the country may be expected to throw upon the market an enormous amount of old material; rails, bridge iron, car-wheels, car-irons, locomotives, tanks and such odds and ends; but with the consumptions of approximately 2,250,000 gross tons of old material as remelting stock used in the open-hearth furnaces in 1901, the markets cleaned up, and prices climbing higher and higher, keeping more than even pace with the price of new material, there must inevitably be some embarassment at a not late date for lack of this kind of material.

It is claimed that open-hearth steel can be made with all pig material, but it is also the dicta of experienced men that it is more troublesome, as it is undoubtedly more costly, as compared with past experience, to do so. The quality of steel produced thus is not satisfactory as yet.

This suggests that some new method of practice must be developed at a not late day, or that the amount of the tonnage of open-hearth steel, which is increasing more and more in demand, may be close to its limit of tonnage output in this country.

There is another factor that is interesting from its probable change of the center of gravity in the tonnage output. Railroads are considered the most productive sources of scrap metal. St. Louis, Kansas City, and other points in the Southwest and South, have been important scrap metal markets by reason of being points of concentration. Until this year the roads in the trans-Mississippi terrritory and South of Pennsylvania and Ohio have not been prosperous to a degree that permitted them to add betterments that the older and more prosperous roads of the North and East have already installed. The consequence is that light rails are being still used on main trackage, and probably will be used, if replaced by heavier on main tracks, for sidings and double trackage, the result of which will be that much material that should, in following out the policy of progressiveness, reach the scrap market this year, will be held back for some time. Wooden bridges that are being replaced by steel ones will not benefit the scrap market, and old cars afford little, for on economically managed roads the irons are used again for repair work. Old wheels will continue to come upon the market in limited quantity, but the heavier wheels are said to have a longer life because of their heavier body and chilled rims. Steel cars are of too recent adoption to hold out much hope of adding to the scrap market for some time.

All this suggests that open-hearth steel making may become profitable at points in the West and South that have not been considered suited for such manufacture. Basic iron ore of great richness, running as high as 64 to 66 per cent, is found in abundance in several places in the Southwest, is abundant in the lower Appalachian ranges, and with proximity to initial markets for scrap, with coal of recent discovery in Texas, Arkansas, Colorado and New Mexico. Some that will make a coke that can be used, although not comparable with the Connellsville article, open-hearth steel making may be developed in new territory with profit, for the freightage on the scrap to the East, plus the freightage on finished material back to the Southwest, may make a change that will alter the complexion of affairs materially.

Shipping also is a large contributor to the volume of scrap metal. The West Indies, South America, Mexico and other outlying parts of

the continent, and even along the coast of the Mediterranean, may be relied upon to supply a material quantity of scrap metal, but it will not pay to bring this far into the interior from the sea-coast as a material for a re-melting. Hence, open-hearth steel making near to the coast, where scrap from over-sea points may be secured, is also a possibility, and as the shipbuilding trade uses and will continue to use an increasing tonnage of open-hearth steel, the manufacture of this variety of steel at coast points gets closer to the profit making point, its freightage on fuel would be a fractional factor as compared with the freightage on scrap to the interior iron and again on the finished material to the same point.

There are other factors that challenge attention, however. Among these are the large increase in the number of open-hearth steel furnaces, another is the constant demand for a still higher and higher quality of steel for multiplied and multiplying purposes. The tendency of open-hearth practice is to improve the quality of the product by increasing the percentage of the scrap used in the stock, hence there is a growing demand for more and more scrap.

Another factor is that the laying of heavier rails is with the idea of getting longer life as well as greater strength to stand the heavier equipment and the greater frequency of train loads. This latter may be relied upon to offset the factor of longer life as to time but not as to amount of tonnage sustained in usefulness, so that the one will about offset the other. There are, however, tentative tendencies to demand open-hearth steel for rails as well as for bridge and structural material where great strength and less corrosive influences from exposure are desired. This is as yet experimental, and so far has been in connection with nickel alloyed steel, but the reports so far made on these experiments indicate high utility and probable specification on limited lines for some time to come.

However viewed, nevertheless, the relation of the scrap metal supply and the output of open-hearth steel is one that demands earnest consideration from the steel makers, and it foretells some embarassing questions for solution by the operators of steel plants in the near future.

PERSONAL MENTION.

Edward N. Hurley, formerly president of the Standard Pneumatic Tool Company, now a director in the Chicago Pneumatic Tool Company, sailed for London, England, April 17, at which place he will meet President J. W. Duntley, and complete arrangements for the sale of the International Pneumatic Tool Company, of London, to the Chicago Pneumatic Tool Company. The Chicago Pneumatic Tool Company received an order April 5 from one European concern for 50 pneumatic tools. The company's foreign business has increased rapidly during the past few months and there is every indication that there will be a proportionate increase in the future.

At the annual meeting of the stockholders of the Seaboard Steel Casting Company, Chester, Pa., Joseph Wharton, Isaac H. Clothier and Morris L. Clothier, of Philadelphia; William C. Sproul and John B. Roach, of Chester; Thomas H. Savery, of Wilmington, Del., and J. Henry Cochran, of Williamsport, were elected directors. William C. Sproul was re-elected president; J. W. Cochran, secretary and treasurer, and S. E. Sproul, general manager.

John Dowling, former furnace manager for the Tennessee Coal, Iron & Railroad Company at Bessemer, will be furnace superintendent for the Sloss-Sheffield Steel & Iron Company. J. C. Maben, the new president of the Sloss-Sheffield Company, and several New York directors will go South this week and take charge of affairs incident to E. O. Hopkins' retirement. Many official changes are expected, but details are not known.

The National Association of Manufacturers voted to hold the next convention at New Orleans and elected D. M. Parry, of Indianapolis, president; E. H. Sanborn, secretary; and Hamilton Cashart, treasurer. D. C. Ripley was elected vice president for Pennsylvania, and James F. Taylor, for Ohio.

The office of F. R. Phillips & Sons Company, in charge of F. Rees Phillips, will be removed from the Schmidt building to room 721 Park building, May 1. Mr. Phillips is making good progress in the introduction of his "Zero" metal and has booked a number of good sized orders.

Herman Blevins, of New Castle, Pa., who for the past two years has been employed with the America Tin Plate Company, has resigned and will now have charge of the electrical machinery at the New Castle Stamping Company's works.

Messrs. C. E. Walker and C. Booth have gone to Europe in the interest of the Chicago Pneumatic Tool Company.

IN AND ABOUT PITTSBURG.

Efforts to consolidate the independent blast furnaces of the Mahoning and Shenango valleys and Eastern Ohio have fallen through, and all options taken on the different plants will expire May 1. Options were secured on furnaces in Sharon, New Castle, Sharpsville and West Middlesex, Pa., and Youngstown, Girard, Leetonia, Danville, Cleveland and Lorain, in Ohio. The furnaces in the Shenango valley to have been included were the Claire and Mabel, at Sharpsville, Fannie at West Middlesex, and the Stewart in Sharon. It is said that E. N. Ohl, of New Castle, and Joshua Rhodes, of Pittsburg, were largely interested in the consolidation.

James Rees & Sons, engine, boiler, and steamboat builders, Fourth street and Duquesne Way, this city, are preparing to start work next week on an addition to their plant. The building will adjoin the company's foundry and will be 80x270 feet, part of which will be two stories. The ground floor will be used as a boiler shop and the second story as the sheet iron department. The building which is at present accomodating the boiler department will be used as an extension to the engine and steamboat hull department. The company is preparing to invite bids on equipment.

The contract for the erection of a large fire brick plant to replace the No. 1 works of the Reese-Hammond Fire Brick Company recently destroyed by fire at Bolivar, has been awarded. The new buildings will be constructed of brick and stone. The large one will be 60x120 feet and two stories; the other, which will be but one story, will measure 45x180 feet. Work on the foundations is progressing, and the buildings will be pushed to completion as fast as possible. It is thought they will be completed by June.

The Cleveland & Pittsburg railroad last Wednesday received a consignment of freight engines, the first of an order placed some months ago. The first delivery included six modern freight locomotives that are to be used in handling the coal and ore traffic between Pittbsurg and the lake ports. They weigh 193,500 pounds in working order, or 173,000 pounds on the drivers. They are equipped with four pairs of drivers, being compound engines with auxiliary trucks. The fire-box is 66x107 inches.

The Dunkirk Coal Company has been organized with $100,000 capital stock by Benjamin Braznell, Andrew Braznell and Charles W. Braznell, of this city. The company, which is also connected with the Stockdale Coal Company, this city, has acquired 400 acres near Monongahela City, which will be developed at once. Plans are being prepared and bids for equipment will be invited in a few days. The output of the mines will be from 1,200 to 1,500 tons daily. The headquarters of the company are located in the Lewis building, this city.

A steel bridge is to be built East of the Edgar Thomson Steel foundries and blast furnaces, near Port Perry, to connect the Union railroad of the Carnegie Steel Company, with the Pittsburg, McKeesport & Youghiogheny railroads. The two companies will do the work jointly. The work on the false work in the bed of Turtle Creek, which is to be crossed has been begun.

The Burns Uniform Steel & Metallic Company has bought a tract of 20 acres just East of Latrobe on the Pennsylvania railroad and will build a steel plant on the property. The latter belonged formerly to the Superior Coal & Coke Company. Drawings of the buildings of the plant are being prepared. The concern was only recently organized and is composed chiefly of Pittsburg men.

The Pittsburg Meter Company is sinking a well for gas to supply fuel for the new brass foundry which is nearing completion at the works in East Pittsburg. This will make the third gas well that has been sunk by the Westinghouse interests at East Pittsburg, one each having been put down for electric and machine departments, and both are doing well.

The New York-Pittsburg Company for the manufacture of typewriting machines has located at Beaver Falls on the site formerly occupied by the tube company. The company is incorporated under the laws of New York, with a capital of $500,000. Operations will begin at once. S. R. Hays, of New York, is president, and W. A. McCool, of Beaver Falls, general manager.

The Franklin Rolling Mill & Foundry Company, with a capital of $750,000 is being organized at Franklin. The company will absorb the Electric Tripartite Steel Pole Company, of New Jersey, and will manufacture steel poles, malleable iron castings, bolts and nuts. The promoters are General Charles Miller, Hon. C. W. Mackey, J. S. Coffin, J. W. Rowland, and O. D. Bleakley.

An application for a charter will be made May 8 by the Stuart Manufacturing Company, of this city. The incorporators are Everson P. Cole, William M. Stuart and William Stuart. The company is to mine coal and manufacture coke, brick etc.

The Page Woven Wire Fence Company, with works at Monessen, Pa., and Adrain, Mich., will increase its capital stock to \$8,000,000. This is to be divided into \$5,000,000 of common stock, \$1,000,000 of preferred stock and \$2,000,000 of bonds. Extensive additions are to be made at both plants of the company.

The American Sheet Steel Company has placed an order with the William B. Scaife & Sons Company, of this city, for the Scaife water purifying and softening system. The plant is to be of 1,500 horse power and be installed at the New Philadelphia works, of the Sheet Steel Company.

Fire in the engine room of the Monongahela plant of the Amelcan Tin Plate Company, at the foot of South Fifteenth street, last Saturday, caused a loss of about \$10,000 fully covered by insurance. The blaze for a time threatened the entire plant, but was finally confined to the engine room and pickling house.

One of the important features of the new bond issue of the United States Steel Corporation for Pittsburg is to build the plant of the American Bridge Company at Economy. Work has been started on the grading and detailed plans have been completed.

The laborers and stockers of the American Steel Hoop Company plant at Duncansville, went on strike a few days ago and the entire plant was forced to close. The laborers receive \$1.15 per day, and demand \$1.35. The stockers get \$1.20 daily wages, and want \$1.40.

The South Connellsville plant of the Baldwin Automobile Manufacturing Company was sold a few days ago to J. C. Kurtz, of Connellsville. The consideration is \$32,000 cash, to be paid at the confirmation of the sale, and a mortgage of \$6,500 with interest for about two years.

The Pittsburg, McKeesport & Connellsville Railway Company has awarded a contract for the installation of an electric lighting plant at Olympia park, Versailles. The plant will have a capacity of 2,000 lights, and will consist of two Westinghouse generators and two Westinghouse gas engines. The new Nernst system of incandescent lighting will be used.

Messrs. H. E. and S. J. Wainwright, Uriah Tinker and others formerly connected with the Union Steel Casting Company, of this city, have organized the Sterling Steel Foundry Company and will erect a plant in this vicinity to make steel castings.

The Fayette Sand & Stone Company, Connellsville, has been organized by Messrs. Bernard O'Connor, Robert F. Shepherd and others of that place, for the manufacture of crushed stone and sand.

The contract for the sheet and tin mills for the new works of Follansbee Brothers & Company, of this city, has been awarded the Wheeling Mold & Foundry Company, Wheeling W. Va. The contract calls for four hot and one cold sheet mills one roughing mill, four hot and five coal tin mills.

The Mechanical Locomtive Stoker Company is being organized at Franklin for the manufacture of a patented mechanical stoker.

NOTES OF THE INDUSTRIES.

A notable shipment of machinery parts was recently made from the work of the Allis-Chalmers Company, at Milwaukee, Wis. It consisted of a steel shaft 30 inches indiameter and 34 feet long, with its fittings. The shaft is hollow forged, with a 10-inch hole, and was finished and fitted for use in one of the plants of the American Steel & Wire Company, at Cleveland, Ohio. The actual shipping weight of the shaft was 78 tons. It will be used with a 40 and 80 x 60 combined vertical and horizontal Reynolds rolling mill engine, carrying a rope wheel 23 feet in diameter by 18 feet face. The weight of the wheel is about 138 tons. The total weight of the finished engine is about 500 tons. The shaft was shipped on two flat cars, being supported at each end by heavy timber blocking well braced longitudinally on the car.

The Niles Iron & Steel Roofing Company, at Niles, O., will abandon its present location and be re-established upon a site adjoining the Niles Mine & Mill Supply Company. The buildings occupied will not be razed although all the machinery will be removed. The plant will be extended considerably when the change in location occurs. A tile building one story high measuring 72x200 feet, will be constructed. Ground for the building has been broken and will be rushed in order to take possession inside of 90 days.

The Virginia Coal & Ore Company has secured possession of a tract of land at Low Moor, Va., consisting of 15,000 acres that is rich in ore and coal. It was the property of the Rich Patch Ore & Iron Company and several shifts are lo-

cated in it. About 9,000 acres are underlaid with ore and the balance contains a vein of steam and coking coal that is from six to seven feet thick.

The Globe Steel Range & Stove Works, Kokomo, Ind., was destroyed by fire recently entailing a loss of $20,000. The fire originated in the pattern department and spread to the mounting department, destroying line-shafting, engines and other machinery, together with partially finished stock and considerable raw material.

The Tway Steel Forge & Machine Company, capital $100,000, has been incorporated in Camden, N. J., by Arthur Bruce, Jerome J. Wood and Edward L. Dodin. The company has purchased two acres of land at Bulson street and Mount Ephiriam avenue, that city, on which it will erect a shop 70x200 feet. It will give employment to about 100 hands.

The Empire Steel & Iron Company, at Macungie, Pa., is about erecting a new blacksmith shop at its furnace. It will be made of frame 20x28 feet in dimensions. This, with a new hot blast to be added later on, indicates that the works are not yet to be abandoned, as was once the belief of all.

Harry G. Hart, proprietor of Hart's Iron Foundry, at Salem, N. J., has completed arrangements to enlarge his plant and has associated with him J. W. Vanmeter, a manufacturer of brass trimmings. The firm has been incorporated with a capital stock of $100,000.

The Cramp Construction Company, Philadelphia, is bidding on the proposed purifying house to be built for the United Gas Improvement Company, at Point Breeze, Philadelphia. It will be a one-story brick structure 37x40.

A new pattern shop is being built to the plant of the Globe Foundry Company, Johnstown, Pa. It is 20x30 feet in size, and is 13 feet high, one story. The building of this is necessitated by the need of room for storage purposes.

Fire, caused by an explosion of molten metal, at the Sharon Steel Company's furnace, Sharon, Pa., destroyed the hoisting apparatus, necessitating the shutting down of the plant. The damage is considerable.

The officials of the Consumers' Gas Company, Johnstown, Pa., are negotiating with manufacturers of electrical machinery with a view of adding an electric light department to the gas plant.

A fire which originated in the carpenter shop of the Aetna-Standard mill, in Bridgeport, O., entirely destroyed the building and the warehouse of the plant, entailing a loss of $20,000.

The Cumberland Cement & Manufacturing Company has arranged to erect a large plant at Riverside, in Mineral county, W. Va., to have a capacity of 3,000 barrels daily.

The machinery has arrived and in a few days the West Jersey Tube Works, at Bridgeton, N. J., will start up its puddling and skelp mills, giving employment to 300 more men.

It is understood that the Youngstown Manufacturing Company, Youngstown, O., will add an open hearth furnace and a small hardware department to its plant.

Robert's furnace No. 1 at Allentown, Pa., has been put in blast after being idle for eighteen months.

The Sharon Brass Manufacturing Company, Sharon, Pa., has been organized with a capital stock of $30,000.

A new pottery plant will probably be erected in Erie, Pa., by J. B. Owens, of Zanesville, O.

The Superior Chain Company, Marysville, Pa., has been organized.

NOTES OF THE SOUTH.

J. M. Elliott, president of the Southern Car & Foundry Company, has bought outright from the Illinois Car & Equipment Company, the car making plant at Anniston, which the former company has operated under a lease for several years. The Anniston plant is the largest and best equipped in the South and has been constantly added to in the way of accessories making it complete in all departments of car building. Work has been resumed on the pressed steel car plant of the Southern Car & Foundry Company at Wylam, near Birmingham.

John C. Brain and others have organized the Standard Fertilizer Manufacturing Company, capital $1,000,000. They claim that they are ready to erect a plant in Bessemer for the manufacture of fertilizers of several kinds with furnace slag as the basis. Captain Brain has been at work on plans for several months.

The sanitary commission of Jefferson county, Ala., will, May 20, receive bids for $30,000 worth of bonds and bids for the construction of a 15 mile trunk sewer, to which the proceeds of the bond sale are to be devoted. The total bond issue will eventually be $500,000.

The Piedmont Petroleum Company, capital $100,000, has been organized by W. K. Colston and W. E. Ragsdale, of New York, and D. E. McClellan, of Peidmont, Ala. The company owns 2,500 acres of land near Piedmont and will drill for oil.

Frederick M. Jackson, former general manager of the Alabama Consolidated Coal & Iron Company, and H. E. Manville, have organized the H. E. Manville Coal Company and will open mines in Tuskaloosa county.

The Alabama Car Service Association reports for March the handling of 52,556 cars, an increase over the same month last year of 10,000.

WEST VIRGINIA NEWS.

Col. T. M. Jackson, C. Sprigg and others, of Clarksburg, are raising funds for the contemplated Tyler Railroad Company, which is to build a road from New Martinsville to Middlebourne, with a possibility of immediate extension to Salem, W. Va.

Frank J. Conroy, of Nampa, Idaho; F. H. McLain, of Allegheny; Pa: C. H. Strouble, of Pittsburg; J. B. Sommerville, of Wheeling, and others have organized the Thunder Mountain Mining Company to operate Idaho holdings.

The Fairmont Coal Company has absorbed the Marion Coal Company, which has works are on the Morgantown branch of the Baltimore & Ohio. The selling price was $50,000.

George D. Hibbs, and others of Uniontown, paid $292,000 for 9,750 acres of coal in Marion and Harrison county. The Short Line Fuel Company will develop the field.

The Jackson Iron & Tin Plate Company, Clarksburg, will issue $125,000 of bonds for working capital. The plant will be ready for business in a few weeks.

The contract for constructing six miles of the Fairmont & Clarksburg electric railway has been awarded to F. H. Blodgett, of Fairmont.

The Fairmont Coal Company is negotiating for the purchase of the Lurig coal works on the Baltimore & Ohio Southwestern in Ohio.

Elkins, Phillipi, and Belington men have applied for a charter for atelephone line operating in the towns named.

Wellsburg will install a modern water works system.

The Largest Chain.

The Standard Chain Company, with headquarters in Pittsburg, has just completed at its works in Lebanon, Pa., the longest and most powerful chain ever produced in the world. A duplicate is to be made, the two for the Eastern Shipbuilding Company, New London, Conn. They will be used on two vessels to ply between San Francisco and ports of Japan.

The completed chain is of 330 fathoms, and an expert of the British Lloyds Register association witnessed and approved the test. When the order was placed it was generally contended that the chain would have to be secured abroad; that the makers here could not supply a chain of the character required.

At the works of the Standard Chain Company, Lebanon, Pa., the tests were made last week. The great chain was subjected to the strain of a new 600,000 pound testing machine, recently installed at the works by the Philadelphia Machine Tool Company, Philadelphia, Pa. The tests were made in the presence of W. Gordon Minchin of London, surveyor of the British Lloyds register. Besides the tests of the monster chain others for high-class ship cables and other marine chain, both in stud and close link, were subjected to successful tests.

Experts throughout the country and in Europe were waiting anxiously for the result of the test of the heavy chain for the Pacific ocean vessels.

It had been expected that the big chains would have to be secured from a British producer, but the Standard company undertook the task and the Pittsburg offices were advised a few days ago of the success. Manager Atwood o the Lebanon works has been watching with much interest the manufacture of the great chain. Cablegrams were flashed to headquarters of the British Lloyds Register association in London to chain makers abroad who are interested, and messages went out to those interested in this country, announcing the success of the venture, producing the largest chain ever put out in the world.

The big chain is what is known as a cable chain of 3 3-16 stud link. Manufacturers abroad had insisted that the Pittbsurg company could not produce the chain and stood ready to be advised of the success of the tests by cablegram at their own expense.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—Aside from the firmness of the tendency of the raw material markets to continue their advances toward extremely high levels, the markets do not display any appreciable changes. The prices on the heavy tonnage contracts of finshed steel seem to be suffering from the pinch between those rates and the higher costs on current raw steel and pig irons, though of course the concerns that booked those extraordinary tonnages are not the sole buyers in the open markets. But where the plants are compelled to buy iron and raw steel to turn out their contracts the difference in the costs of the raw stuffs and the prices on the finished steel is too great to permit the permanency of both the high rates on raw material and the relatively low rate on the finished products. If it were not for the palpable fact that general prices, especially on raw products, are entirely too high it might be thought that the natural course of values would be upward for some time to come. Bearing in mind, however, that there is a difference of from $4 to $5 per ton in the costs of raw material in the last few months, it will be readily apparent that the extremely high costs on the raw products must come down or steer the markets directly into another buyers' panic. The existing conditions may prevail for another quarter, or perhaps another six months, but beyond that lies a point of danger which those who insist upon inflations should watch closely. Under the circumstances it would be a comparatively easy matter to bring about another panic, nothwithstanding the influence of the United States Steel Corporation. The memories of 1899 are not so old that they should be ignored entirely.

When the present improvement in iron and steel began to make a serious display, standard Bessemer pig was sold easily at valley furnaces at from $15.25 to $15.75 per ton. Today the minimum price for the same material at the same point is $20 per ton, equivalent to $20.75, Pittsburg delivery. That difference must be taken from the rather conservative prices fixed for the year on finished steel products which makes a strong difference in that branch of steel making.

Mill iron is strong at the phenomenally high price of $19.50, while basic is just as firm as any of the raw material at $20, delivered at Pittsburg. There is not the slightest easement in any of the raw products, either as to price or deliveries. Billets are nominally quoted at $32.50 and $32 per ton, Pittsburg base, but actual sales are made from $2 to $3 per ton higher.

The finished steel lines are making some slight head way against the demand but there is no hope that the plants will soon be on even terms with their books. The best that can be done or hoped for is to keep the mils operating steadily with the maximum of production. There are fewer complaints now than for months over tardy deliveries and the mills are slowly gaining ground. The demand is as urgent as ever but there is a better disposition to wait for material if promises can be secured, which is a difficult task. The railroads are making better deliveries of fuel and metals so that in the absence of accidents at the blast furnaces and steel plants the demand will be met fairly well. The shipments are heavier now than for almost a year and the extensive piles of finished steel which have occupied the yards of the steel mills for so long are growing smaller weekly.

CURRENT QUOTATIONS:

Basic	$19 25		Splice bars	1 50
Bessemer		20 75	Angles	1 60
Charcoal, hot	28 00		I beams	1 60
Charcoal, cold	25 00		T beams	1 60
Fdy, Nhn		19 50	Z beams	1 60
Fdy 2, Nhn		19 25	Channels	1 60
Fdy 3, Nhn		18 50	Boiler plates	1 75
Mill Iron	19 25		Fire-box	1 85
Fdy 1, Shn	19 50		Sheared	1 65
Fdy 2, Shn	19 25		Tank	1 69
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50
Grey Forge, Shn	18 60		No. 1 wrought	20 00
Bessemer billets	32 50		No. 1 cast	17 00
Open hearth	34 00		Iron rails	25 00
Steel bars	1 50		Car wheels	18 00
Iron bars, refined		2 00	Cast borings	10 00
Light rails		37 00	Turnings	13 00
Standard sections	28 00		Sheets, 26	2 90
Bolts, iron, sq nut	2 50		Sheets, 27	3 05
Hex nuts	2 65		Sheets, 28	3 10
Spikes	2 00			

Philadelphia—Iron and steel prices continue strong and probably average an advance on last week's closing figures. There is great scarcity of material, and prospects of relief are not encouraging for the near future. The scarcity of pig iron is getting worse, and negotiations which were under way looking to the importation of a round lot of Bessemer iron by one of the leading steel companies have been abandoned, as it was found that the price of the iron at the point delivery was so high that it precluded the possibility of using it. It is likely that many of the steel plants will be more or less handicapped in their operations for some months on account of the shortage of iron. There is also a great scarcity in most of the finished lines, and it is stated that foreign markets are being ransacked.

No large lots of pig iron are being sold in the local market, mainly for the reason that a number of the large consumers have covered their requirements for several months. Most of the business being done at present is by small con-

cerns or those who have met with delay in deliveries and are compelled to buy something to tide over an emergency. Nominally the range of prices for the standard of brands of Northern iron, tidewater delivery, is practical'y unchanged.

Transactions in steel billets are of very small volume because of their continued scarcity. Prices are anywhere from $32.50 to $34.

The demand for finished iron and steel is assurgent as ever, mills being quite unable to cope with all the work that is offered to them. Orders have therefore to be scaled down or postponed, which in many cases involves serious troubles to those who have large contracts under way. The same difficulty is met with in all parts of the country, as applications for material are received from all points of the compass without finding much, if anything, to help them out in this market. Quotations are nominally unchanged, but in most cases considerably more is necessary to secure anything like reasonble attention.

CURRENT QUOTATIONS:

Foundry, 1	$20 00	21 50
Foundry, 2	18 50	20 50
Gray Forge	17 50	18 50
Bessemer billets		33 50
Open h'rth bil'ts	35 00	
Steel bars	1 70	1 80
Refined iron bars	1 90	
Standard rails	28 00	

Girder rails	32 00	32 50
Angles, 3" & lr'gr		1 80
Under 3-inch		1 90
T's 3" and larger		1 85
Under 3-inch		1 90
Heavy plates		1 80
Beams and chanls		1 85

New York—Rogers, Brown & Company—Incidents of the week requiring comment are not numerous. There has been a further advance in the price paid for spot iron, but the volume of this business is too small to cut any figure in the average costs of foundry and mill men. As before stated, melters have, as a rule, made contracts covering anticipated wants. The urgent demand applies to cases where actual needs exceed estimates or where furnaces are behind in contract deliveries.

There is no apparent relief from the scarcity, except by importations either of pig or finished forms. These are steadily increasing in volume, several thousand tons of pig having been engaged the past week. The trouble is, however, that prices in England and Germany are extremely sensitive to demand from this side, the advance there fully keeps pace with the rise at home. No. 3 Middlesboro, which sold in warrants at forty-three shillings two months ago, is now close to forty-nine shillings. Ocean freight also show a tendency to improve as demand increases.

It need hardly be stated that the entire furnace plant of the country is pushed to its maximum and that little increase of output can be looked for before midsummer, when some of the new furnaces under construction by the large steel works will be completed. There is still plenty of trouble in assembling raw material because of lack of railroad equipment. Some of the large systems are receiving an average of a new locomotive a day and freight cars in like proportion, but freight officials say that the effect is scarcely noticed, so great is the shortage.

The first vessels of the Lake fleet have discharged ore cargoes at Lake Erie ports and are on the way back. The Tonowanta Iron & Steel Company unloaded several boats the last of last week, which sailed Saturday with return cargoes of coal. breaking the record for early lake traffic.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$19 50	21 00
No. 2X fdy Jersey City	17 65	20 00
No. 2 plain Jer. C.	17 25	
Sohn. 1 fdy N. Y.	21 00	
No. 2 fdy N. Y.	20 00	
No. 3 fdy N. Y.	19 50	
No. 1 soft	16 75	
No. 2 soft	17 00	
St'l r'ls Estrn mill	28 00	
Sheets, 3-16 and 1/4 red, at store, N. Y. per 100 lbs.	2 30	2 40
Sheets, blue annealed, 10	2 70	2 80
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00
Plates 1/4 and heav	3 15	
Ship & tank plate, on dock	2 50	2 50
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10
Beams and chan'ls 15-in & under	2 00	2 50

Angles	2 00	2 50
Tees	2 00	2 50
Zees	2 00	2 50
Time deliveries, basis $1.75 for angles, beams and channels		
Com. base, bars per 100 lbs.	1 65	1 70
Refined base, bars	1 85	1 90
Bands, base	2 40	2 50
Norway bars	3 75	
Norway shapes	4 25	
Old T rails, iron f. o. b. cars	20 00	21 00
T rails steel f o b c	16 50	17 50
No. 1 wro't scrap iron f o b cars	17 50	18 00
No. 1 mach. scrap	13 50	14 50
Old wrought pipe and tubes	13 00	14 00
Old car wheels, f. o. b. cars	16 00	17 00
Old ham. car axl's f. o. b. cars	22 00	23 00
Wrought turnings deliv. at mill	11 50	12 00

Chicago—The market is relieved from stagnation only by the pertinacious inquiries of users. This applies to almost if not all products. Pig iron is dull from the fact that there is very little iron for sale. Large producing interests have disposed of most of the year's expected output and about all the work left is the supervision of deliveries. These are generally fair but occasionally some producer fails to ship, or the railroad fails to forward the needed iron, then there is a rush for the open market and fancy prices are paid for whatever iron can be found. This is almost nothing, the scant supplies coming mainly from the smaller producing companies. There is practically no change in pig iron values.

Quite a tonnage of iron bars in lots of 1,500 tons down to single car lots has been sold within the past week. It is difficult for the producers to keep the differential between iron and steel bars at $4 but scrap is very high and shows little inclination to recede. This makes the high price almost unavoidable. However, some iron bars are being sold at an advance of only $2 above steel. There is revived inquiry for rails in moderate lots for late delivery, for merchant steel and in fact almost everything on the list. There are no changes in quotations except for

spot shipments and on these prices are quite variable.

Old material is arriving from the country in large volume than for many months. The railroads also are offering a quite heavy tonnage. But demand is excellent and values are fairly steady.

CURRENT QUOTATIONS:

Bessemer	20 00	21 00	Sheets, 26 store	8 25	8 80
Fdry Nohn 1	19 00	19 50	No. 27	8 35	8 40
Northern 2	18 50	19 00	No. 28	8 45	8 50
Northern 8	18 00	18 50	Angles	1 75	
Southern 1	18 65	19 65	Beams	1 75	
Southern 2	18 15	19 15	Tees	1 80	
Southern 3	17 65	18 65	Zees	1 75	
Forge	17 15	18 15	Channels	1 75	
Charcoal	21 00	22 00	Steel melt'g scrap	17 00	18 00
Billets, Bessemer	32 00	34 00	No. 1 r. r. wrought	20 00	21 00
Bars, iron	1 85	1 95	No. 1 cast, net ton	14 50	15 00
Bars, steel	1 75	1 80	Iron rails	25 00	26 00
Rails, standard	28 00		Car wheels	19 00	20 00
Rails, light	32 00	36 00	Cast borings	8 00	8 50
Plates, boiler	1 90	2 00	Turnings	13 00	14 00
Tank	1 75	1 80			

Cincinnati—Sales of odd lots only have been made in this market in pig iron during the past week. and little else may be expected for some time to come. Furnaces are well sold up, and consumers are well bought ahead. There is a strong demand for iron for the last half of the year. but to present about all that consumers can do is to await developments.

The Southern Association has continued to maintain its position of the low basis of $12, Birmingham, for No. 2 foundry iron but so far as heard from have made no sales. Considerable has been said regarding the efforts of consumers to place large orders for the future, about nothing has been accomplished, as the inclinaton of large buvers has been to wait for a more settled conditon of the market. In the meantime there has been a little business in immediate deliveries, for which, in some cases, buyers have paid fancy prices, the outside quotations herewith given representing the minimum. The following are the quotations for pig iron cash, and manufactured prodnot, 60 days.

CURRENT QUOTATIONS:

South. fdy. 1	15 25	$16 75	Standard Sections	29 90	30 90
South fdy. 2	14 75	16 25	Sheet, 26	3 40	
South. fdy. 3	14 25	15 75	Sheets, 27	3 50	
South. fdy. 4	13 75	15 25	Sheets, 28	3 60	
Grey forge	13 75	15 00	Angles, 3 to 6 in	1 70	
Mottled	13 50	15 00	Angles, 1¼ to 2¾	1 82	
Shn. 1, soft	15 25	16 75	Beams and Chanls 15 in and under	1 70	
Shn 2, soft	14 75	16 25	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	18 10	18 75	Tees	1 75	
L. Superior, 2	17 60	18 25	Z's	1 70	
L. Sup'r char'l c w	21 00	22 00	1 wrought scrap	14 00	15 00
Hang'g r'k ccl, 1	22 50	23 00	Steel mlting stock gross ton	13 00	14 00
Solin ccl c w	20 35	20 60	No. 1 cast	12 00	18 25
Jaksn cy. silv'y 1	18 35	18 60	Old iron rails g t'n	18 50	19 50
St'l brs base hlf ex	1 72		Old car wheels	15 25	16 00
Iron bars	1 82		Cast borings	6 50	7 00
Flange plates	1 80		Turnings	7 00	7 75
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

Birmingham—The basis on which sales of pig iron have been made in Birmingham the past week and more, is $15 for No. 2 and it has sold as high as $16. Offers to take considerable quantities at $15 per ton keep coming in. Some sales for No. 2 at $15 per ton delivery in 1903 have been made. The sales at the advance are made by the small concerns, the larger ones still adhering religiously to their fixed purpose not to let the market get on a boom. The tension is getting very high, however, and the pressure brought to bear on the larger operators, to make them advance prices is causing apprehension. Never before in the history of the iron trade in the South has the Southern maker failed to advance his iron as rapidly as possible and gone with the bull element. It is believed that the remarkable situation in the South now is due to influences of the operators in the North. Cars have become plentiful again and movements of iron, coal, and pipe are unhampered. The rolling mills are in need of more men to operate plants to the capacity justified by the order books, and many importations are made. All the smaller industries, such as the foundries and machine shops, have all they can do. The status is unchanged in the Southern industrial territory except for the pressure brought to bear on the larger iron corporations to advance prices.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 50	13 50	Tank	1 80	
No. 2 fdy, Sohn	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 50	12 00	No. 1 wrought	14 00	
Grey forge, Sohn	11 00	11 50	No. 1 cast	12 00	
Billets	23 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	310	3 50
Fire box	2 00				

Coal.

Pittsburg—The movement of lake coal has not begun to get under way, but there is a liberal delivery of fuel for local consumption for the first time in several months. The supply of cars is almost up to the normal for local coal transportation and the extraordinary activity of the mills and factories completes the picture of consumption. In the coal market as with all other staples, especially those connected with iron and steel interests, the problem is no longer one of costs but of regularity of supply.

Cleveland—The coal situation does not even add color to the freight market, for it is confessed that the season opened too soon for those shippers, and for the so called independent fleet as well. The coal movement has not started with any vigor so far.

Cincinnati—The market has been quiet, and steady, closing inactive and unchanged. Pitts-

burg afloat is held at 7 cents per bushel of 2,688 cubic inches, and Kanawha at 6½ to 7 cents afloat. Prices to consumers are as follows per ton of 2,000 pounds delivered: Pittsburg $3 Kanawha, $3; smokeless $3.25; anthracite $7. There has been only a small movement of coke but prices have been sustained. Gashouse 8 to 9 cents per bushel, crushed 8 to 9 cents per bushel and city manufactured 10 cents delivered.

Chicago—There is weakening in the smokeless coals of West Virginia about 25 cents per ton, caused by the fact that the annual business in the West was not well distributed among the producers, those who did not share amply in the rush a few weeks ago now reducing prices. Western coals also are scarcely holding their old basis in values, due to large production. The Illinois Steel Company has closed for most of its fuel requirements for the coming year, the bulk of the tonnage, about a million tons, going to the Danville, Ill., district. But there is still much uncertainty concerning the stability of present freight rates and this fact is delaying much of the annual contract business. Consumers are active in asking for figures and much tonnage will probably be bought within the next few weeks. It is the expectation of shippers that more bituminous coal will come up the lakes this season than in 1901.

Coke.

The operations in the Connellsville field proper and in the new Masontown territory took a strong spurt during the week and both production and shipments were materially increased. The gain in production was not so heavy but the advance in the tonnage of shipments was much above what was expected, bringing the supply of fuel stock at furnaces and plants up to the normal of good shipping times.

The Masontown field made the strongest gain in proportion to its capacity. The increase in production was only 74 tons in the Connellsville field proper while the shipments from the Masontown territory reached a gain of 101 cars or 2,626 tons.

All the receiving points report gains in stock, the aggregate for the week running 246 cars over the preceding week. The strongest gains were made to Pittsburg and river points and to points East of Everson. The gain in tons shipped was 3,251 tons over the preceding week.

Furnace operators and foundrymen report that so far as the supply of fuel is concerned they are easier than for several months and with the same ratio of arrivals of stock the blast furnaces will have no complaints to make. The stock at furnace yards is up to the requirements with always some surplus and the fear of a suspension from lack of coke has passed away.

A summary of the Connellsville region for the week shows 20,535 ovens in blast and 751 idle.

The following figures show the scope of operations.

Production for the week	224,477 tons,
" last week	224,403 tons.
Increase	74 tons.
Shipments—	
To Pittsburg and river points	3,664 cars.
To points West of Pittsburg	5,655 cars.
To points East of Everson	2,119 cars.
Total	11,438 cars.
Last week	11,192 cars.
Shipments in tons for week	248,475 tons.
" " " last week	245,224 tons.
Increase	3,251 tons.
Masontown Field	
Shipments for week	660 cars.
" last week	559 cars.
Increase	101 cars.
Shipments in tons	17,160 tons.
" last week	14,534 tons.
Increase	2,626 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

In these days of organization of large manufacturing interests, the ownership of such property is becoming more and more thrown into the shape of stocks and bonds.

Pittsburg is becoming not only the center for the manufacture of iron and steel, but is growing in importance as a place for the sale of iron securities.

Robert C. Hall, member of the Pittsburg Stock Exchange, will be pleased to give any information possible at any time concerning these securities, or make transactions therein.

Telephone Long Distance 3613 Court, or write No. 345 Fourth Avenue, Pittsburg, Pa.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots......37c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ......35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ......33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ......35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ......30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat stripe, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lot of 100 pounds, $1.10 per lb.; special price on large lots

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including April 21, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	497,984	300,077
Tidewater	204,821	69,606
Southwest	23,896	178,428
Eureka	23,896	701,645
Buckeye, Macksburg oil	3,552	282,221
New York Transit	763,900	
Southern	485,994	....
Crescent	136,483	....
Total	2,149,821	1,513,981
Daily averages	107,486	76,950

Buckeye / Indiana Local Division	812,058	1,024,815
Daily average	40.582	51,240

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
April 16	$1.35	$1.20	$1.20	$0.88	$0.83	$0.83
April 17	1.35	1.20	1.20	0.88	0.83	0.83
April 18	1.35	1.20	1.20	0.88	0.83	0.83
April 19	1.35	1.20	1.20	0.88	0.83	0.83
April 21	1.35	1.20	1.20	0.88	0.83	0.83
April 22	1.35	1.20	1.20	0.88	0.83	0.83

The Metal Markets.

Tho metal markets.

LONDON—Tin—£130 15s-£126 10s. Sales, 680 tons spot; 830 tons futures.

Copper—£53 17s 6d-£52 12s 6d. Sales 1,550 tons spot; 2,600 tons futures.

Lead—£11 13s 9d-£11 11s 3d.

Spelter—£18-£17 12s 6d.

NEW YORK—Tin—$29.00-$28.25.

Copper—Lake, 12⅛-12 c; electrolytic, 12⅛-12 c: casting, 12⅛-12 c.

Lead—$4.15

Spelter—$4.50-$4.37½.

ST. LOUIS—Lead—$4.20½—$3.97½.

Spelter—$4.25-$4.15.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	10.75	c
Copper, light bottoms	9.50	c
Heavy Composition	10.75	
Brass Turnings	7.00	
Heavy Brass	8.62½	
Light Brass	7.37½	
Heavy Lead	3.90	
Tea Lead	3.70	
Zinc Scrap	3.12½	
No. 1 Pewter	19 00	

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight .... [illegible]

Bessemer Steel, 100 lbs. .... [illegible]

Bessemer Steel, 95 lbs. .... [illegible]

Bessemer Steel, 90 lbs. .... [illegible]

American Charcoal Terne—I. C., 14x20 ordinary .... [illegible]

I. C., ordinary .... [illegible]

American Coke, f. o. b. mill, quoted at $4.25 for full we[illegible] 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 [illegible]

Foreign Coke Tins, I. C., 14x20 (for importation,) Besse[illegible] Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4 75.

Ore Situation at Cleveland.

The fleet managers of the boats which are [illegible]gaged in the iron ore trade had their first se[illegible]ious difficulty in this port a few days ago becau[illegible] of the strike of the Licensed Tugmen's Prote[illegible]ive Association. The first big ore loaded [illegible] for the season came into port. There were [illegible] of the trust boats and a couple of others, [illegible] loaded to the greatest depth that the chan[illegible] in the rivers would permit. When they arri[illegible] off this port there was not a tug to take cha[illegible] of them. The barges were dropped by th[illegible] steamers at the end of the piers, and then [illegible] crews started to work them up stream by mea[illegible] of the donkey engines and capstans. This [illegible] slow work, and it took the better part of the [illegible] to get the barges up to the ore docks. Th[illegible] steamers made better headway because they we[illegible] able to go most of the way under their [illegible] steam, using the ropes only as guides.

The W. L. Brown, which was on the bar [illegible] Ashtabula, also came in and was worked up [illegible] her dock without much difficulty. She broug[illegible] the first cargo from the Michipicoten fields.

TRAVEL LIKE PRINCES.

Those who saw the special train in which [illegible] R. H. Price Henry of Prussia made his tour [illegible] the United Sates are comparing it with o[illegible] trains in regular service, and it is admitted t[illegible] none of the cars in the train compare favor[illegible] with the buffet, compartment and stand[illegible] sleeping cars of the Pioneer Limited train[illegible] the Chicago, Milwaukee and St. Paul Railwa[illegible] daily service between Chicago, St. Paul [illegible] Minneapolis. The people of this country h[illegible] the satisfaction of knowing that at any t[illegible] they can not only travel like Princes, but [illegible] get much better service.

Rod Mill Dismantled.

Jones & Laughlins, of the South Side, have just completed the conversion of its large continuous rod mill into a continuous merchant mill and the first work was done last Monday, in charge of Charles Geyer. There have been various rumors given why this large rod mill was dismantled but no statement has been made officially. One rumor stated that there was not sufficient boiler capacity to supply power to drive the mills. It is known that on many occasions when a six-pass was to be made that there was not sufficient power to make three. Another rumor was that the mill was extremely cramped for space and that the gearing was so complicated and delicate that repairs which often had to be made, were very costly. Probably the most correct rumor is that there was an agreement made with the American Steel & Wire Company to discontinue the manufacture of rods and in return the American company would purchase all the merchant material it required from Jones & Laughlins.

The new three-high 40-inch continuous blooming mill, now being built from designs made by Julian Kennedy, the well-known mechanical expert, will not be ready for some months. A new boiler house is being built along the river front to generate sufficient steam with which to drive the new mill. This mill will be of the continuous type, having a roughing and finishing mill. The 200-ton Talbot open-hearth steel furnace will probably be making steel before the first of next month. This furnace is the largest of its kind in the world and is housed in very large building.

Jones & Laughlins are now figuring on erecting an immense boiler house plant, comprising 20,000 horse power horizontal water tube boilers It is understood that bids will soon be taken for this work.

Located Mines And Ovens.

Thomas Lynch, president of the H. C. Frick Coke Company and general manager of the coal and coke interests of the United States Steel Corporation, has just returned from an extended trip to the Pocahontas field, where mines and oven plants for the combine have been located. Mr. Lynch was accompanied by E. J. Buffington, president of the Illinois Steel Company, which will be the largest users of the coke; O. W. Kennedy, general superintendent of the Frick Company, and Williams G. Wilkins, chief engineer in charge of operations on the Tug river.

Locations were made for eight mines and for from 1,000 to 1,200 coke ovens, to be built at once. It is the purpose to start mining coal within the next month and store it pending the completion of the railroad being built along the South bank of the Tug river East from Welch. The contract has been awarded to Louis Carr of Welch for the installation of a saw mill and for the felling of the forest immediately adjacent to the mines.

The Norfolk & Western is building the 10-mile branch of the railroad from Welch and it is not expected that it can be completed until September. Heavy material cannot be hauled into the locations before that, but the combine will hurry operations in a preliminary way to prevent delays in the fall. It is expected that coke can be made by Christmas. The purpose is to have an initial coke output of 3,000 tons a day. This will be increased within the coming three years, wnen the combine hopes to have completed in that district 3,000 ovens of the latest type. The United States Coal & Coke Company, as a subsidiary company of the United States Steel Corporation, will mine the coal and make the coke, and the H. C. Frick Company will distribute it. The opening of the mines is for the purpose of giving the Ohio and Chicago plants of the combine a plentiful suppy of coke without the long rail haul now necessary.

Extensions Are Promised.

A conference was held April 17 at Philadelphia between Vice Presidents Pugh, of the Pennsylvania railroad, and Turner, of the Pennsylvania Company, both in charge of transportation of their respective lines and representatives of the United States Steel Corporation and its allied interests for the purpose of effecting some arrangement whereby the transportation and terminal facilities at Pittsburg can be improved.

The steel corporation, along with other large shippers, has been seriously handicapped during the last year by reason of the failure of the Pennsylvania lines to handle its shipments promptly. This condition was brought about principally by the reason of the company's inability to supply sufficient cars and motive power to handle the extraordinary business, not only of the steel corporation and its allied interests, but other concerns as well.

With the delivery of a number of new cars and engines expected by the Pennsylvania railroad some months ago, the officials of the company feel that they will be able to overcome many of the present difficulties, and of this the representatives of the steel corporat were practically assured.

Opening Southwest Mines.

Selwyn M. Taylor, consulting engineer of the Fort Smith & Western railroad and San Boise Coal Company, has returned to Pittsburg from an extended inspection trip through the company's coal properties in Indian Territory. Many Pittsburgers are in the venture, including H. C. Frick; F. L. Robbins, president of the Pittsburg Coal Company; F. M. Osborne, president of the Pittsburg & Youghiogheny Coal Company, and W. R. Woodford, general superintendent of the Baltimore & Ohio. The company is opening three mines, but intends producing from 15,000 to 20,000 tons day within the next three years. Experiments will be conducted in Pittsburg to test the coal for coke making.

The coal lands extend for 20 miles along the Fort Smith & Western railroad, which is being built through the Choctaw Nation 200 miles to Guthrie, Okla. It is believed the coal areas will extend beyond what is already known to exist. The coal is said to be practically of the same quality as the Pocahontas fuel. The vein is five to seven feet thick. The railroad has been extended 50 miles, and the building of the remainder is being pushed as fast as the contractors can work. Coal is being shipped from the three mines but further developments along the line will be made at once. The present output is about 600 tons daily.

The Fort Smith Railroad, which expects to spend $4,000,000, now connects with the Missouri Pacific, the Frisco line; Kansas, Pittsburg & Gulf, and when the present plans are completed the line will connect with the Sante Fe & Rock Island roads at Guthrie, and the Missouri, Kansas & Pacific. It is the purpose to ship coal to Galveston and Gulf of Mexico ports, Kansas City, and Omaha, Guthrie and Little Rock, and points throughout that Western district. It is not believed that the Texas oil will interfere in the least with the coal production.

Samples of the coal, are expected in Pittsburg within a short time, and these will be coked to show what can be done in that direction. It is believed that a good coke will result. If such should be the case it is the intention of the company to build coke oven plants.

The Pittsburg Tool Steel Wire Company.

The Pittsburg Tool Steel Wire Company, mention of the organization of which was made in these columns, has been incorporated with $25,000 capital stock. The company is building a plant at Monaca, which will be equipped with the latest improved appliances for the manufacture of drill rods and wire for needles, awls, taps, screw drivers, nail sets, cork screws, steel balls, roller bearings and many other articles requiring high grade material.

The plant will consist of a brick structure 50x150 feet which will contain the wire drawing and straightening machines, and an iron clad building 75x75 feet to contain the furnaces, gas producing plant, etc. The power plant will include a 100 horse power "Warren" gas engine. F. C. Eaton, vice-president and general manager of the works was for the past eight years superintendent of the drill rod and wire department of the Crescent Steel Company, now a part of the Cucible Steel Company of America; Werner Kaufman, president; and G. Stengel, Jr., secretary and treasurer of the company, are well-known steel merchants of Philadelphia. The company expects to have its plant in operation by July.

May Be Neville Island.

General officials of the United States Steel Corporation state that the location of the extensive tube plant which the company is preparing to erect has not been definitely decided upon. Choice of sites has narrowed to Lorain, O., and Neville Island, and it was stated that one of them would be chosen and that announcement of the selection might be expected at an early date.

The statement that the new financial program of the corporation would contain provision for a large plant for the American Bridge Company to be erected at Economy, Pa., is confirmed. No other feature of the scheme for improvements has disclosed.

;orporation Stock Transaction.

A special meeting of the United States Steel tockholders to vote on the proposed issue of 250,000,000 bonds, with the proceeds of which 200,000,000 prefered stock will be retired, leav- ig $50,000,000 available for other purposes, will e held in the combine's offices at Hoboken, N.J., lay 19, at noon. The resolutions to be sub- iitted at the meeting are:

First—The resolution declaring it advisable hat holders of 2,000,000 shares of the outstand- ig stock of the corporation consent to the re- emption of that amount out of the bonds or the roceeds of bonds bearing interest at the rate of 5 er cent per annum, the principal being payable 1 60 years and at the pleasure of the corpora- on, redeemable after the expiration of 10 years rom the date thereof.

Second—The resolution authorizing the issue f bonds for $250,000,000 to be secured by a mort- age, lien or pledge upon the property and the ocks of other corporations now held and owned r hereafter acquired by the United States Steel orporation. This lien or pledge shall be next nd similar to that securing the bonds of the orporation for $304,000,000, issued under and se- ured by the indenture to the United States rust Company, of New York under date of pril 1, 1901, and authorizing the offer to pre- rred stockholders of the $250,000,000 bonds at ar, payable $200,000,000 in preferred stock at ar and $50,000,000 in cash.

Third—The resolution authorizing the issue nd sale for cash of $5,000,000 bonds of such dis- iption and so secured for the corporate pur- oses of the corporation.

Fourth—The resolution authorizing and ap- roving a contract between the corporation and P. Morgan & Company, under date of April 1, 02, providing for the public offer by them to e preferred stockholders of such bonds and for e acquistion by them of such of said bonds as eferred stockholders shall not take, all as set rth in the contract.

Fifth—To vote to consent or not to consent to deem and retire preferred stock, substantially the extent and in the manner provided the above resolutions and contracts, of which pies may be obtained by stockholders at the fices of the corporation.

The transfer books closed for the special meet- g April 19 and will reopen May 20.

The Chisholm & Moore Manufacturing Com- any, Cleveland, O., will build an addition to s foundry at the corner of Lake and Hamilton reets. The new buildings will be 63 x 100 feet e story in height. It will cost $3,500.

Pennsylvania Steel Meeting.

The first annual meeting of the Pennsyvlania Steel Company was held at Camden, April 15. The report of the board of directors submitted by President E. C. Felton was approved. It shows the net earnings from operations to be $2,879,272, with $323,559 additional from rent and income from investments and interest. The gross income from all sources was therefore $3,202,831, from which is deducted $550,113 interest on bonded and floating indebtedness, making the net income for the year $2,652,718. From this sum reserves for depreciation amounting to $491,211 is deducted, the net gain of the operating companies for 1901 being $2.161,506.

Out of this net gain the operating companies have paid dividends amounting to $1,150,750, which has gone into the treasury of the company During the year the sum of $253,662 was expended for improvements.

The balance sheet of the company shows the total assets, including cash, loans, stocks and bonds, to be $27,859,025, and the liabilties, including the capital stock and surplus, a like amount. The old board of directors was re-elected.

Ohio Coal Sold.

The transfer of the holdings of W. P. Rend & Company, of Chicago, operating the largest independent coal mining properties in Ohio, to the Continental Company, of Pittsburg, announced a few days ago, involves $1,000,000, and embraces six a large mines, machinery and other appurtenaces. This takes from the independent field the last company of any consequence in Ohio. The Hocking valley field will henceforth be under the absolute control of the Pittsburg Coal Company, the Sunday Creek Coal Company, backed by the Morgan interests, and the Continental, which is backed by interests working in harmony with the Monongahela River Consolidated Coal & Coke Company. The Continental has favored properties along the Hocking Valley and the Toledo & Ohio Central railways, with the view to procuring short and speedy access to the lake ports, and all its recent purchases are within a short distance of these lines.

Mr. Rend was a pioneer in the Ohio field. He shipped the first train load of coal over the Hocking Valley Railroad.

Plans for three boiler houses and a forge shop for the Reading Railway, at Reading, Pa., have been prepared by Wilson Brothers & Company, of Philadelphia.

March Engine Sales.

The Allis-Chalmers Company report the principal sales of the company's engines during March as follows:

Virginia Electrical Railway & Development Company, Richmond, Va., One 20-inch and 40 inch x 42 inch steeple compound direct coupled Reynolds-Corliss engine; Milwaukee Electric Light & Railway Company, Milwaukee, Wis., two 28-inch and 60 x 48 inches vertical cross-compound direct coupled Reynolds-Corliss engines; Republic Iron & Steel Company, Youngstown, O., vertical round frame compound blowing engine, steam cylinders 46 inch and 88 x 60 inches, air cylinders, 76 inch and 76 x 60 inches; Goes Lithographing Company, Chicago. 14x36 inch girder frame Reynolds-Corliss engine; C. C. Manuel & Sons, Richford, Vt., 16x36 inches girder frame Reynolds-Corliss engine; Fond Du Lac Street Railway & Light Company. Fond du Lac, Wis., 20-inch and 40x48 inches 1890 frame cross--compound direct-coupled Reynolds-Corliss engine; T. C. Williams Company, Richmond, Va., 12 x36 inches girder frame Reynolds-Corliss engine; Fort Smith Cotton Oil Company, Ft. Smith, Ark., 22x48 inches 1890 frame Reynolds-Corliss engine; Victor Chemical Works, Chicago, Ill., 16x36 inches 1890 frame Reynolds-Corliss engine; Von Boeckmann Brothers, Seguin, Texas, 14x42 inches girder frame Reynolds-Corliss engine; Milwaukee Harvester Company, Milwaukee, Wis. 22-inch and 44x42 inches 1890 frame cross-compound direct-coupled Reynolds-Corliss engine; H. B. Sherman Manufacturing Company, Battle Creek, Mich., 16x36 inch girder frame Reynolds-Corliss engine; St. Louis Plate Glass Company, St. Louis, Mo., two 22-inch and 44x60 inches 1890 frame tandem compound Reynolds-Corliss engines; Buckstaff-Edwards Company, Oshkosh, Wis., 20x42 inch girder frame Reynolds-Corliss engine; Southern Cotton Oil Company, New York city, one 18x48 inch girder frame Reynolds Corliss engine, one 18x42 inch girder frame Reynolds-Corliss engine, six 16x42-inch girder frame Reynolds-Corliss engines, two 16x36 inch girder frameReynolds-Corlis, one 14x42 girder frame Reynolds-Corliss engine, one 14x36 inch girder frame Reynolds-Corilss engine: Harbison-Walker Company, Pittsburg, Pa. 22x42 1890 frame Reynolds-Corliss engine; Henry Disston & Sons, Philadelphia, Pa., 24x48 inch 1890 frame Reynolds-Corliss engine; Twin City Rapid Transit Company, Minneapolis, Minn., 46-inch and 94x60 inch vertical cross-compound direct-coupled Reynolds-Corliss engine, second order; Richmond Passenger & Power Company, Richmond, Va., one 18-inch and 36-inchx48 inch 1890 frame cross-compound direct-coupled Reynolds-Corliss engine: Southern Cotton Oil Company, Charlotte, N. C. one 16x42 girder frame Reynolds-Corliss engine; San Angelo Water Works Company, San Angelo, Texas, one 18x36 inch 1890 frame Reynolds-Corliss engine; Continental Bolt & Iron Company, Chicago, one 16x36 inch 1890 frame Reynolds-Corliss engine.; Oriental Consolidated Mining Company, Korea, one 16 inch and 28x42 inch tandem girder frame Corliss engine; Lamson Consolidated Store Service Company, for Gimbel Brothers, Philadelphia, one 12x36 girder frame Reynolds-Corliss engine; P. L. Kimberley, W. Dreyfus & A. E. Nusbaum, Wyoming, one 14 inch and 24 x42 tandem compound non-condensing Corliss engine; Pennsylvania Railroad Company, one horizontal cross compound Riedler compressor, air cylinders 15 inch and 24x36 inch, steam, 14 inch and 24x36-inchm capacity, 1,500 cubic feet per minute to 100 pounds pressure; J. B. Hoggin, Peru, one duplex-differential Riedler pump, capacity, 1,000 gallons per minute. Delaware & Hudson Company, Scranton, Pa., two 28x48-inch hoisting engines;, one 26x48 inch slope engine.

New Aluminum Alloy.

Walter Rubel, of Ludwigsburg, Germany, has obtained a patent in this country on a new alloy, to improve the technological properties of aluminum without increasing its specific gravity. A proportion of four to seven per cent phosphorus is added to the aluminum, by which the density and firmness are increased and a tough substance is obtained. An alloy of aluminum with phosphorus containing the above mentioned proportion of the latter gives a sharp defined casting, and only contracts to the extent of one to one and one-half per cent at the utmost, and the color is not blue, as is the case with alloys of aluminum and magnesium, but silvery. The alloy does not easily oxidize and can be soldered.

The Alliance Machine Company, Alliance, O., has been organized with a capital stock of $200,-000, the officers being W. C. Whitehead, president, W. H. Purcel, secretary and general manager and W. S. Milbourn, treasurer. New shops are being erected which will be throughly equipped with electrically driven tools. According to Mr. Whitehead it is the intention to add to the plant a foundry and such other additions as the trade shall warrant.

The Jackson Iron & Tin Plate Company, Clarksburg, W. Va., has filed a deed of trust covering all its property to Willard F. Snyder and John W. Davis, trustees to secure bonds amounting to $15,000 for the purpose of making improvements to its plant.

ine Dust Explosions.

:t seems to be a more or less general practice many mines in some of the central states to w down the fan about firing time, with a w to lessen the danger of explosions, par- ularly in localities where gas practically s not exist, in dry dusty, workings offer- ; conditions favorable to so-called dust ex- sions.

This practice would seem to have been en a fair trial at many collieries, and the per- ent question suggests itself, in the light of ent events, has it contributed to the safety of ners in lessening the dangers of explosions?

This commission investigated the condition the mine and the cause of the explosion at t Creek ,Iowa, submitted the results of its estigations on the cause of explosions in the l mines of Iowa, the conditions under which se explosions are likely to occur, and such er information as was considered important this connection.

The advantages of insufficient pure air supply l decreased amount of ventilation at firing e are dwelt upon at length, yet the practice ondemned, stating that impure air may pre- t an explosion, but is impracticable as well langerous to life to resort to it as a remedy.

The report is supplemented by recommenda- s of Messrs. Reese and White, men who by ning and experience could seem to be calcu- d to advise intelligently in these matters, ask that their suggestions as well as the er recommendations of the commission be cted into law. Messrs. Reese and White rec- nend that all shots be fired by men employed the purpose, and shots shall only be fired n all employes, except the shot firers, are of the mine. This system has for its sup ; its use in neighboring states, on the the that two men can examine and fire shots 100 miners, thus exposing only two per ; of the employes of a mine to the dangers he so-called dust explosion, which they it is possible even after every recommenda- made by the commission is enacted into and the law lived up to by all parties con- ed.

is latter idea prompts the inquiry—should the initiative, in matters pertaining to re- s in mining methods, come from operator miner, acting from motives of mutual in- st, rather than from legislative bodies?— n Mines and Minerals.

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w Coal Company—The Stonega Coal & Coke pany has been incorporated under the laws of Jersey with a capital stock of $2,000,000. It is understood that the object of the company is to mine coal in Pennsylvania. The temporary address of the organization is given at 35 North Second street, Camden, N. J. The incorporators are John Wentz, Mauch Chunk, Pa.; Daniel E. Wentz, Big Stone Gap, Va.; Robert H. Sayer, South Bethlehem, Pa.; Samuel Dickson, Bullitt building, Philadelphia; W. B. Whitney, 714 Reading terminal, Philadelphia; John L. Wentz, 712 Reading terminal, Philadelphia and William D. Lippincott, 33 North Twelfth street, Camden, N. J.

The West Penn Construction Company has been organized in this city by Messrs. William W. Lucius, Edward C. Lucius and Harry H. Patterson, to erect, construct, inspect and repair buildings, structures, works, etc.

Work has been begun on the new power house of the Pittsburg Railways Company, at Carnegie, which is to supply that division with power. Two new 300-horse power dynamos will be installed. A new 1,000- horse power storage battery will also be received from Pittsburg.

Patents.

The following patents granted April 15 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Press for working sheet metal, E. F. Griffin, Finchley, and W. E. Higgs, London, England; locomotives, John Player, Topeka, Kas.; tubular boiler, J. A. Stinmetz, Philadelphia; steam boiler, J. S. Stevens, Barberton, O.; combination water and fire tube boiler, T. B. Butman, Chicago; boiler furnace, W. M. Green, Evanston, J. R. Gent, Chicago, and H. A. Poppenhusen, Evanston, Ill.; apparatus for making molds and cores, H. C. Lambert, Fernbank, O.; process of drawing molten metal from receptacles, Luther Lincoln, Boston; dash pot, M. R. Moore, Indianapolis, assignor to Atlas Engine Works, same place; rotary explosive engine, J. A. McLean, Boston; furnace bridge walls and fire arches, H. A. Poppenhusen, Evanston, Ill., (2.); condenser, Frederick Sargent, Chicago; automatic dumping ore car, C. H. Snow, San Francisco; portable crane, G. F. Speer, St. Louis; rotary engine. Jacob Treemling, Union Hill. N. J.; furnace damper controller, D. H. Harris, Cranford, N. J.; arch for boiler furnaces, J. P. Michalski, Chicago; Bessemer steel plant, C. H. McCullough, Jr, and L. C. B. Holbwe, Chicago; casting apparatus, A. M. Acklin, Pittsburg; automatic injector, C. B. Allen, Wadsworth, O.; metallurgical crane, D. W. Blair, Perth Amboy, N. J.; generator for gas engines, G. W. Bonds, Fresno, Cal.; pneumatic hammer, Joseph Boyer, St. Louis, assignor to Chicago Pneumatic Tool Company; ore crusher, C. C. Calkins. Los Angeles, Cal.; electric furnace, M. R. Conley, New York, assignor to Electric Furnace Company. same place; boiler furnace, G. S. Gallagher, New York, assignor to Economy Furnace Company, same place; apparatus for purifying water for boilers, Albert Gray, Newcastle-upon-Tyne, England: locomotive drive wheels, L. H. Kenyon, Allegheny; glass gathering machine, D. C. Ripley, Pittsburg: apparatus for coating metal plates, J. H. Williams, Abertillery, England; bottle or jar press, Jonathan Haley, Akron, O.

New Rivet Cap.

The Judson L. Thompson Manufacturing Company, of Waltham, Mass., has obtained control of a patent recently issued to William P. Bartel, of Waltham, on a tubular rivet cap. It is formed from a circular disk of sheet metal by dies, the rim turned over to form an annular recess, while the central portion is struck up to constitute a pyramidal spreader located within the rim. This spreader may have four, six, or any number of angularly disposed faces as may be desirable.

The tubular rivet is driven through the stock in the usual manner, the end of the shank coming into contact with the cutting edges formed by the adjacent faces of the spreader will split the shank and cause the ends to diverge and engage under the rim of the cap.

Adding to Furnace Tonnage.

Rogers, Brown & Company, Cleveland William G. Park, of this city, J. G. Battelle. of New York, David T. Croxton, D. B. Meachan, and others will build two 400 ton blast furnaces at Cleveland under the style of the Cleveland Furnace Company. Julian Kennedy of this city has received the commission to plan and build the furnaces which will cost almost $1,000,000. Sufficient additional river dockage will be erected to accommodate the new plant.

Archer Brown, William G. Park, J. G. Battelle, D. B. Meacham and S. W. Croxton will comprise the board of directors.

New Wire Drawing Plant—Ground has been broken at Perth Amboy by the Standard Underground Cable Company on the copper wire drawing plant to be there this summer. It is the intention to produce 200,000 pounds of copper rods daily, and the Pittsburg works will be supplied with raw material as well as the large new cable plant at Perth Amboy. The plant will be completed at the end of this year.

The Standard company has purchased its rod and wire supplies heretofore but recently it was decided to build a plants of its own to make the company independent of the market with respect to rods. The plant will be one of the largest and finest in the country, especially equipped for the rolling of copper rods. It is believed that the economies in manufacture secured with it will represent an enormous saving even though the rods for the Pittsburg plant will have to be carried a long distance.

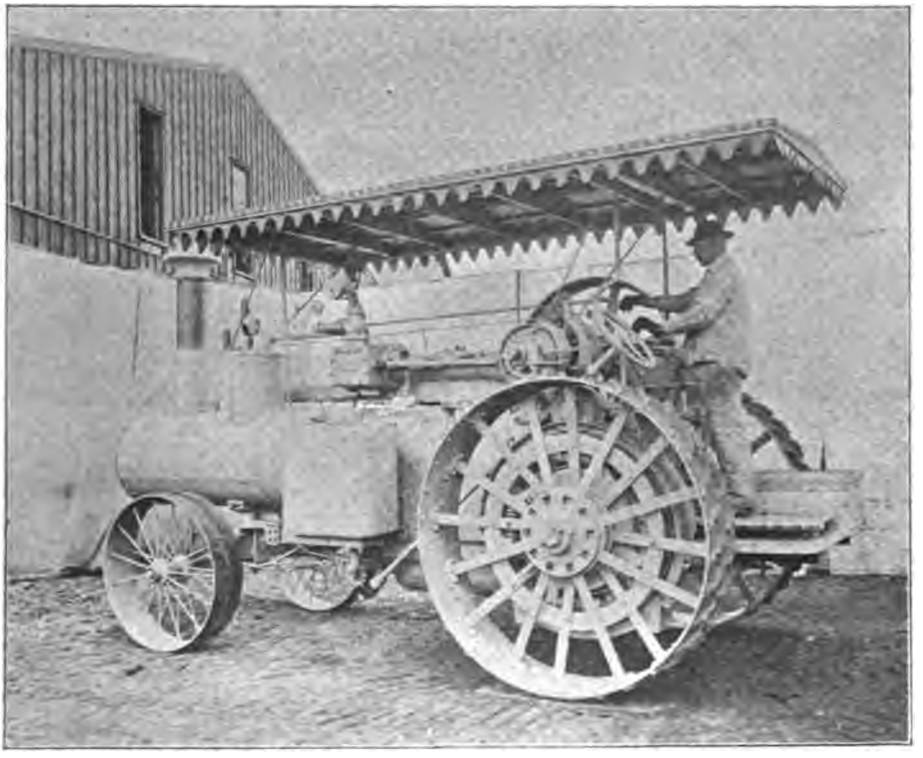
The Standard has received large orders for cable from the Cleveland Electric Illuminating Company, of Cleveland, and the Alleheny County Light Company. The Pittsburg and Perth Amboy plants are rushed to their capacity with orders.

The William Tod Company, Youngstown, O., contemplates the building of a large shop for erecting purposes.

TRACTION ENGINES.

BY WALDON FAWCETT.

ALTHOUGH steam traction engines have been found useful by the British army in the transportation of supplies in South Africa and steam vans are extensively employed for heavy trucking in Europe, notably in England, the United States may justifiably be designated as the especial field of the traction engine. Here the greatest development has taken place, not alone in the weight, size and power of the machines but also in the number and diversified character of the classes of employment, to which the traction machines have been decreed to be adapted. From the primary utility of threshing operations the field of the traction engine has been broadened until now the machines are employed in the various phases of farm work from plowing to harvesting; the operation of saw-mills; rice threshing; cotton gin-



Modern Steam Traction Engine.

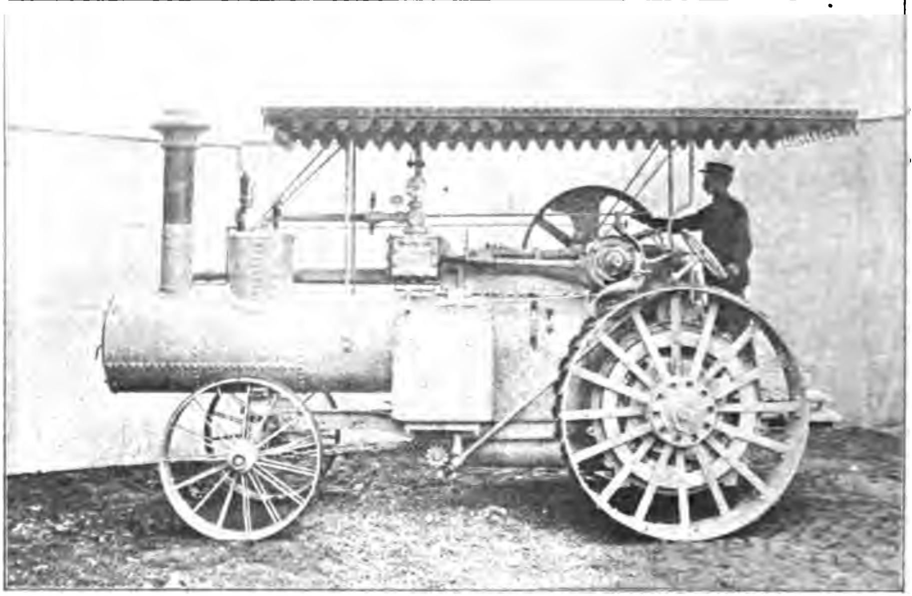
ning; the removal of stumps in clearing operations; and the entire wide range of freight transportation on rural highways.

The principle of the traction engine is very simple, the power being communicated by a series of cog wheels. A roller and link-chain connect the fly wheels with the drivers and the guide wheel or wheels in front. The chains fit into teeth in much the same manner as in the case of the bicycle. It is estimated that there are eight thousand traction engines in operation in the United States and the largest of them are of full 30 horse power capacity. The boilers are usually jacketed in order to prevent as far as possible a loss of heat by radiation. The water consumption of the average traction engine is about twenty-three pounds per horse power per hour. The evaporation of nine pounds of water is obtained by the consumption of one pound of fuel and a working pressure of 150 pounds to the square inch may be maintained

with ease. The general efficiency of the approved modern type of traction engine has been contributed to in an extensive degree by the introduction of the compound engine.

Three different classes of fuel are used in traction engines in as many different sections of the country and the furnace in the high-class traction engine will burn any one of the three kinds equally well. In the Northern section of the country wood is the fuel most commonly used; in the East and South coal is employed almost universally; and in the West straw constitutes the fuel most frequently used. When straw is burned but a single large bar is necessary. This is very heavy and is placed in the center of the furnace allowing for a large opening on either side into which may be dumped the large cylinder which forms.

The capabilities of traction engines present a wide range. For instance, the smallest engines in general use have a maximum threshing capacity of from 60 to 75 bushels of wheat per hour, whereas the capacity of the powerful machines employed in the harvest fields of the Pacific coast is from 300 to 400 bushels of wheat per hour.



Late Type of Steam Traction Engine.

Transferring the basis of comparison to the lumbering field it is found that in saw mill practice the smallest engines are capable of handling from 6,000 to 8,000 feet of lumber an hour, while the capacity of the most powerful machines is in the neighborhood of 25,000 or 30,000 feet an hour.

It is on the Pacific coast, by the way, that there is afforded the most remarkable exemplification of the economic possibilities of the traction engine. As the initial step in a season's operations on one of the large farms to be found in this section of the country, the plowing is done by one of the larger size traction engines drawing a line of twelve, fifteen or even twenty ordinary steel plows and making a furrow, or rather succession of furrows, fourteen inches deep and from twenty to thirty feet wide at every trip across the field. Naturally certain delays are inevitable owing to the necessity for halts in order to move one plow or another around an obstruction such as a stump, but under ordinarily favorable circumstances the plowing will proceed at the rate of fifty acres a day.

In harrowing the achievments of the traction engines are still more remarkable. For this class of work special harrows have been designed. As a rule they are fifty feet square—ten times the size drawn by horses and two or three of these giant har-

rows are operated simultaneously by a single traction engine, thus covering from five hundred to seven hundred and fifty square feet of ground into which the teeth sink to a depth of six inches. A traction engine of the most powerful type employed in California will drag harrows over twenty or twenty-five acres an hour, or in other words, will cover two hundred and fifty acres in an ordinary working day, and if desired seed drills may be attached to the harrows.

In harvesting operations, the traction engine is similarly omnipotent and harvesting records of one hundred and fifty acres of wheat or oats per day are by no means uncommon. The advantages of the traction engines for road haulage have of later years come to a more general appreciation than ever before. In lumbering operations, particularly have they proven of the greatest value, and are now being employed in every branch of the industry from the getting out of the logs to their delivery at railroad shipping points. Roads with a grade of from ten to fifteen per cent which had long been a source of worry to the lumbermen have been robbed of their terrors by the traction engines and in some parts of the country where logs must be transferred anywhere from thirty or sixty miles in order to reach a railroad, traction engines of the more powerful type are daily moving loads of from twenty-five to forty thousand feet of lumber at speed of from four to five miles an hour.

With the added power acquired by the traction engines, has come a corresponding revolution in the road wheels of the machines. A few years ago the wheels on the largest engines did not exceed fifty inches in diameter by six inches in width. Now there are many engines the wheels of which are seventy-two inches in diameter and thirty inches in width while for use on low, spongy land there have been built engines with wheels ninety inches in diameter and sixty inches in width. Recent estimates indicate that in farming operations the traction engines enable a saving of not less than 80 per cent over man and horse power, whereas a saving of 65 per cent is claimed in lumbering operations.

Our Gas Coal in Denmark.

A CARGO of American gas coal was used for twenty-four hours March 1 at the Copenhagen gas works in the production of gas in retort house No. 1, with the following report: Quantity of coal used, 144.14 tons; gas produced, 1,159,300 cubic feet; gas produced by each ton of coal, 11,091 cubic feet; power of the gas, 16.52 Hefner light 76 Omm 15 degrees C.; coke resulting from each ton of coal, 16.37 pounds; ashes in the coke, 7½ per cent.

The coal was in large pieces, so that, before using, crushing was necessary. One should have machinery for that purpose.

The coke was firm, substantial, and gave a good heat, but left considerable slag in the fire box. We consider the coke good for industrial use. In stoves it burns well, giving off strong heat, but requires good draft. Regarding the residuum of tar and ammonia water, little can be said from so brief a trial.

As compared with English gas coal, in regard to the production of gas, the American coal stands certainly as high and in some respects higher than the very best.

The result, as regards amount of coke, is like that obtained from good English gas coal, but the quality is somewhat higher.

This coal must therefore be considered a specially good gas coal.

The coal was sold at 20s. $4.86 per ton c. i. f. With better shipping arrangements and larger cargoes, this price can be much reduced. Two cargoes of Canadian coal of 5,000 tons each have just been sold at Copenhagen at 15 s. 3d. $3.63 c. i. f.

New German Car Coupling—Consul General. O. J. D. Hughes writes from Coburg, March 22, 1902: A new car coupling is being tried on the line from Berlin to Oranienburg, which has for its object to lessen the space between the cars. With this system, the distance has been reduced to 20 centimeters (7.8 inches). The buffers are the same as in the old cars, but the springs, which are a little shorter than before, are built into the cars, thus making the shorter couplings possible. The question has been raised if the shortening of the couplings will not bring about an increase of danger from collisons. Careful trials, however, have proved that this is not the case, as the effect of the buffers remains the same as in the old system.

JEFFREY ELECTRIC LOCOMOTIVES.

THE accompanying illustration shows a four-ton Jeffrey electric locomotive of the single end gondola type, that is to say it is arranged so that the motorneer is seated at one end of the locomotive. It is equipped with two motors of 10

Jeffrey Four Ton Electric Locomotive.

horse power each. They are of the enclosed multipolar railway type. Each axle is driven by one of the motors through single reduction gearing. The gears are of steel with machine cut teeth. This locomotive develops a draw bar pull of 1,000 pounds at a speed of six to eight miles per hour. Upon a level track and clean dry rails it will haul a gross train load of 33 tons made up of mine cars with well lubricated loose wheels. With smaller friction losses in the train the locomotive will haul proportionately greater loads. All controlling mechanism is arranged so that the motorneer does not have to leave his seat to operate any portion of it.

The Jeffrev electric controller is of substantial construction, thoroughly insulated where necessary, and inclosed to protect contacts and wearing parts from dirt and moisture. The controller is arranged that motors may be reversed only when the current is shut off. A separate switch is provided that motors may be started and run either in series or parallel, enabling the motorneer to use the current economically in starting, at the same time giving him opportunity to start heavy loads with motors in parallel when a long distance from the power house where the line of voltage is liable to be low. This feature is particularly valuable in mine work where it is not considered necessary to run heavy copper circuits, or where the rails are not carefully bonded for the return circuit.

Resistance coils of ample capacity and having large radiating surfaces are provided for starting the locomotive, and for running at slow speed when desired.

The brakes are operated by a screw and hand wheel which renders the mechanism self-locking in any position the motorneer desires to leave it. Pressure upon the several brake shoes is equalized by a system of levers so that the braking effect is equally distributed upon the wheels, and all the wheels wear equally.

Sand chambers are provided at both ends of the locomotive and the operating levers placed within easy reach of the motorneer.

The head lights shown in the illustration are of the oil type, but electric head lights of either the incandescent or arc lamp pattern may be used upon the locomotives.

The trolley pole is placed at one side of the locomotive, thus bringing the trolley wire outside of the rails so that the danger of electric shock to men or animals within the mine is eliminated. The locomotive is arranged so that the trolley pole may be placed upon either side to suit the arrangement of mine wiring. The bumpers and draw bar are made to suit the requirements of the cars which the locomotive has to haul.

The four-ton locomotive shown is built to any gauge from 18 inches up. The minimum height above rail is 29 inches and the length over all, excluding bumpers, is nine feet three inches. The wheels are 24 inches in diameter and the wheel base is 36 inches.

The Jeffrey Manufacturing Company manufactures electric locomotives ranging from two tons to twenty tons weight, and of several styles, the principal of which are the "Jeffrey Standard" in which the motorneer sits in the middle of the locomotive and is protected by the locomotive frames from injury in case of collision or derailment; the "Single End Gondola" style in which the mortorneer is seated at one end of the locomotive; and the "Double End Gondola" style in which the motorneer may sit at either end and still have complete control of the locomotive. For any of the different styles of locomotives mentioned cabs may be provided for the protection of the motorneer when the locomotive is used for surface traction purposes, such as switching, or in doing duty abont the yards of industrial plants.

The Jeffrey Manufacturing Company manufactures also an extensive line of electric storage battery locomotives for use in gathering coal from the rooms of mines, thus replacing animals and saving the cost of wire and metal rails for the rooms The storage battery locomotives are also used quite extensively about the yards and inside the buildings of industrial plants where for various reasons it is undesirable to have trolley wires or third rail conductors.

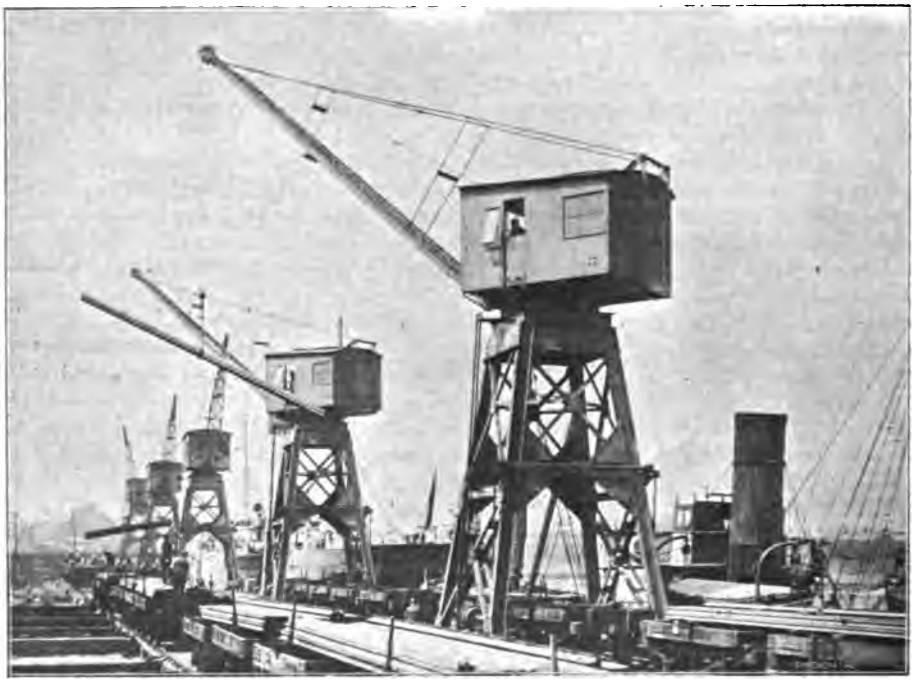
The Jeffrey Manufacturing Company is located at Columbus, Ohio, and among the products of the establishment is a complete line of coal mining and coal handling machinery, besides complete mine equipments, coal washers, screens, tipples, etc. They also manufacture and install complete power house machinery including engines, boilers, and electric generators of all sizes.

THE SPIRIT LOCOMOTIVE WAGON IN GERMANY.

FRANK H. MASON, United States Consul General at Berlin, Germany, says in a report dated April 2:

In a report from this consulate on the manufacture and technical use of alcohol in Germany, brief statement was given of the several obvious reasons which constrain the government of this country to promote and encourage by all practical means the use of alcohol for technical purposes including, lighting, heating, and the generation of power by means of spirit motors of various types.

A more recent manifestation of this general spirit and purpose has been the publication April 1 of an offer of a first, second, and third prize of 10,000, 5,000, and 2,000 marks ($2,380, $1,190, and $476,) respectively, for the best "Vorspannmaschine," or



Electric Cranes at Middlesborough (Egland) Docks.

draft wagon, and with alcohol motor. These prizes are offered jointly by the Ministries of War and Agriculture, Domains, and Forestry, and are designed to hasten and bring out in complete form the several types of spirit-motor vehicles for military and general purposes, which were more or less imperfectly represented and reported about at the exposition of the alcohol industry which took place here from the 8th to the 16th of February.

The specifications are elaborate and precise and provide for a machine which shall weigh, when equipped, supplied and manned in working order, not to exceed 7,500 kilograms, 15,750 pounds and the heaviest laden axle shall not carry, when in service, more than 5,000 kilograms, 11,023 pounds. The other specifications are synopsized as follows, as of possible interest to American inventors, and also because they describe the present standard of efficiency for such motor vehicles in Germany. The machines shall be able to run on good roads, having nowhere a more abrupt ascent than 1 in 10, at an average speed of 5 kilometers (3.1 miles) per hour, or 70 kilometers (45.3 miles) per day. and to haul under the same conditions another vehicle or

vehicles weghing up to 15,000 kilograms (31,500 pounds). The machine shall carry a supply of spirits, oil, and all other materials sufficient for a run of two days without replenishing. When running alone without trailing vehicle, the machine must be able to ascend a grade of one in five. It must be able to travel over all grades that are practicable for loaded wagons drawn by horses or oxen, and to traverse fields, meadows, and ordinary farm lands, or to ford streams or ponds in which the water does not exceed 40 centimeters (16 inches) in depth.

It must run backward as well as forward, be able to make on occasion of necessity eight kilometers (about five miles) per hour when running forward or three kilometers (1.8 miles) per hour backward. The machine must be provided with two independent brakes, one of which will automatically act to prevent retrograde movement when the vehicle stops in ascending a grade. The construction must be such that the driver can start, reverse, or control the direction of the machine or oil its principal bearings without descending to the ground. All working joints, axles and journals must be protected against mud and dust, and all parts of the machine must be susceptible of being made standard and interchangeble in the event that either prize winning model shall be accepted by government for military or other uses. The driving wheels shall have a diameter of not less than 1.6 meters (63 inches)nor more than two meters (80 inches;) the tires, a tread of 16 to 18 inches in width. The height of the fixed portions of the machine above the road level shall not exceed 250 centimeters(eight feet three inches); the width, 215 centimeters (seven feet one inch;) length 600 centimeters (19 feet nine inches); and the length of wheel tread, not over 350 centimeters(11 feet 5.8 inches).

The motor must be able to use crude alcohol without admixture of any other material, or, on the other hand, to use alcohol mixed with benzine or other product of petroleum without injury to the working parts of the machine, and must be provided with igniting apparatus of the best modern type. All tanks which carry inflammable material must be equipped with safety cocks that will avert all dangers of explosion. The balance wheel, if used, must be made of steel, and so located and shielded as to offer no danger to the attendants. The machine must be able to start and run, or be reversed quietly, without shock or undue noise; must be capable of running in snow or over icy, slippery, or muddy roads; and be able to work continuously twenty-four hours without repair or cleaning.

The points which will be especially considered in the coming competition will be the following:

(1) Relation of initial weight to motive power and the susceptibility of the machine to use ballast for climbing steep grades or hauling excessive loads.

(2) Relation of cost of machine to effective power.

(3) Consumption of spirits per ton kilometer or mile.

(4) The time consumed in making the prescribed 70 kilometers per day.

(5) Durablity.

(6) Ease and facility of control by the engine-driver.

(7) Interchangeability of parts.

(8) Freedom from noise, smell, and visible smoke or steam.

The trials will be held under the management of experts representing the Ministry of Agriculture, Domains, and Forests, and will continue three weeks. All machines designed for the competition must be entered before February 1, 1903. The application must be accompanied by drawings to scale of all parts and details, originals or certified copies of all patents involved in the construction of the motor wagon, and the price at which it can be built and furnished to the government.

France has taken a strong and successful lead in the application of alcohol motors to automobiles of various classes for travel and the lighter forms of business vehicles. Germany now follows with this definite reach toward a higher and more advanced application of the same material to the heaviest class of locomotive vehicles required for engineering, military, or agricultural purposes. The whole German system of producing and using alcohol for industrial and technical purposes is worthy of the careful study of American economists.

Method of Supplying Water to Furnace Tuyeres and Coolers.

BY W. J. FOSTER.

MESSRS. T. & J. BRADLEY & SONS, of Darlaston, England, have in operation a new blast furnace, which is the largest in South Staffordshire. On this furnace several improvements have been made, which make it of considerable interest to British blast furnace engineers. So far it has not been possible to modernize the boiler plant or blowing engines, so that the furnace is at present working on the old pressures, and has not, therefore, had a chance to show what it can do. The new furnace takes the place of two old brick stacks, built in 1851. The dimensions of the new furnace are 72 feet, six inches high; bosh 20 feet; and internal capacity 16,000 cubic feet. The average make over four months has been 570 tons a week, which is small compared with American make but large in contrast to the old furnaces, which made 80 tons a week. The quantity of air supplied is only 14,000 cubic feet per minute, the average temperature being from 800 to 900 degrees Fahrenheit. When equipped with modern engines, boilers and stoves, it is expected that the furnace will turn out 1,400 tons a week. It is of interest to mention that the old furnace had a record make of 204 tons in one week with the same engine, boiler pressure, and ovens, that are at present in use. In considering these figures, the character of the ore smelted must be taken into consideration. The furnace makes a special high silicon foundry iron, the material used being hematite ore, Gubbin stone, and Forest of Dean, etc., although Northampton ironstone, with an average iron content of 32 per cent is also used. The average iron percentage of the mixture is not, however, over 48 per cent.

It is a well known fact that there are many explosions in blast furnaces caused by leaking tuyeres and coolers. These and other circumstances have prompted the management of the new furnace to use an improved method of water supply, in order to overcome these difficulties by absolutely preventing water from entering the furnace through leaks in the tuyers and coolers. Under the hitherto existing system of overhead pressure for water supply, water enters the furnace through leaking or sweating tuyeres and coolers, leakage being at times very difficult to detect.

The life of a blast furnace tuyere depends upon—

(1) The volume of water circulating around the nose end of the tuyere; a large volume of water means keeping the water and tuyere cool, and preventing as much as possible the calcium salts and magnesium sulphates contained in the water, which are less soluble in hot than cold water, from precipitating on the interior of the tuyere coils. These salts, being bad conductors, would tend to cause the burning of the tuyere.

(2) The area of the tuyere nozzle. The greater the area of the nose of the tuyere, the greater is the local heat generated in the zone of the tuyere. Increase in the temperature of the blast has a similar effect on the tuyeres.

(3) The heat conductivity and fusibility of the metal the tuyere is made from.

(4) The snuffing up of the tuyere nose, which is usually due to excess of lime.

(5) The conditions the furnace is working under, and freedom from "pockets" under the tuyeres.

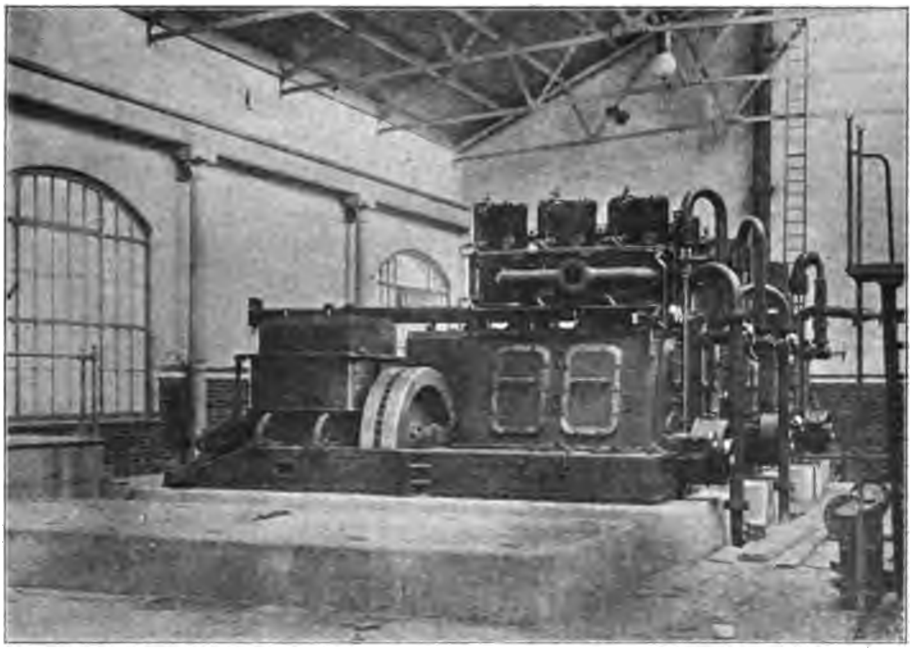
The pocket, which consists of a dense and semi-fusible material of which an analysis is given below usually too low in silica and mixed with too much carbon to be fused, is most difficult to deal with, and it is often through water from leaky tuyeres or coolers coming into contact with the metallic iron held in the pockets that explosions take place. It is claimed that by the method of suppying water, in use at Darlaston, it is an impossibilty for water to escape from the tuyere or cooler to the pocket.

This method of water supply has been in operation at the Darlaston Green furnaces for a period of twelve months, and the results are highly satisfactory, exceeding all expectations, considering its simplicity. As the efficiency of this meth-

od depends upon the amount of vacuum generated, and the amount of air displaced by the instrument working it, it is requisite to have a pump with a large water end and long stroke, or a deep syphon with ejector, etc.

The method at present applied at Darlaston for drawing water through the tuyeres is by adopting a special pump and connecting it to all the tuyeres around the furnace with a nine inch circular suction main. It was found, as expected, that if a tuyere worked hot to such an extent to generate steam, the steam from such a tuyere would pass into the second main, and, coming in contact with the water in the main, was instantly condensed, thus assisting the formation of the vacuum, and at once rapidly drawing the water through the hot tuyere. If, on the other hand, a tuyere should work hot enough to generate steam when working by the pressure system it is very difficult to get the water through again after getting so hot, and this is one of the reasons why tuyeres are lost under the pressure system.

The supply tank at the feed side of the tuyere is governed by a special ball valve to prevent an overflow of water should the tuyere at any time become burnt. It is



Siemen-Bellis High Speed Engine and Generator Sets at Middlesborough (England) Docks.

also put at such a distance above the tuyere that the weight of water must always be less than the lowest internal pressure in the furnace-hearth that is likely to exist while the blast is on the furnace. The water connections to the tanks are so arranged that if a tuyere should burn out, the back pressure from the furnace automatically shuts off the supply of water from the tank, to that when the blast is taken off the furnace no water can enter. If a tuyere should only be slightly burnt so that the vacuum gauge is not affected, it can always be ascertained in the following different ways:—1—By the temperature of the water on the discharge end of the tuyere. 2—By a slight vibration on the discharge end due to air or gases entering the coil of the tuyere. 3—When the blast is taken off the furnace a hissing noise may be heard at the plug hole, which is due to gases passing into the tuyere. 4—By closing the blast throttle valve and the vacuum supply cock to the tuyere under examination, while the blast is off the furnace at the other tuyeres, when, if a small hole is present, moisture will appear at the plug hole, contaminated with other gases, so that the hand will become moist when held in front of the plug hole.

It is not a difficult matter to draw water through a tuyere, after a ⅜ inch hole has been burnt into it, sufficient that the tuyeres shall live until the hole has become sealed up with some material from the inside of the furnace, or until it is convenient to change it. This I have tested by drilling a ⅜ inch hole into a tuyere before introducing it into the furnace and afterwards applying the vacuum system to it for about fifteen minutes, after which the hole became sealed up. This was proved by disconnecting the vacuum end and allowing the delivery pipe to dip a few feet below the tuyere with the supply also a few inches below the tuyere and at the same time taking the blast off the tuyere, to prevent the tuyere from burning owing to insufficient water supply. By this time I found that water would freely syphon through it which could not possibly be the case if the hole still remained in the coil; on the other hand a tuyere has worked 14 days with a ⅜ inch hole drilled into it without sealing up. From this, and other experiences, it appears quite evident that a tuyere under ordinary conditions would last a good deal longer than tuyeres worked on the pressure system with a head of water that would find its way into the furnace if the tuyere should burn.

The analysis given below of material taken from underneath a tuyere with the iron pocketed against it, will be of interest.

Iron (metallic), 40.310 per cent; alumina, 5.630 per cent; manganese oxide, nil; lime, 27.300 per cent; magnesia, .650 per cent; phosphorus .782 per cent: sulphur, 4.432 per cent; silica 14.800 per cent atmorphous and graphite carbon, 4.700 per cent; oxides in combination with small quanities of iron and loss, 1.376 per cent.

It is evident that a tuyere working in close proximity to materials of this description is very dangerous, and many explosions have been the result. The explanation of this is that the iron in the pocket coming into contact with the tuyere, being very hot and at the same time a good conductor, rapidly conducts the heat to the tuyere and causes the water passing through the tuyere to be more or less in a state of ebullition: the globules of steam which are then formed prevent the flow of water in the hottest part of the tuyere, and both water and steam being bad conductors, would allow the tuyere to burn; on the other hand with a partial vacuum on the discharge end of the tuyere, the globules of steam would be rapidly removed and thus allow a rapid flow of water to continue. A serious explosion occured at No. 2 furnace, Darlaston Green, some time ago, through the iron being held by pocket in front of the tuyere and cooler, and it was thought, until a search had been made, that the explosion was due to a slip. The tuyere in question had been changed several times through leakage, and just before the explosion occurred the furnace keeper had the blast taken off to stop up the cinder notch. Immediately the blast was taken off the furnace the tuyere side was blown off, killing a man, breaking the blast connections, and scattering about 15 tons of the materials from the furnace. The tuyere in this instance was perfectly sound, but after the furnace, which was at once stopped, had cooled down for about a fortnight, it was found that the cooler under the tuyere, a flat cooler, had been leaking through a hole ¼ inch in diameter. The conclusion arrived at was, that while the blast was on the furnace, the molten iron was kept away from the tuyere and cooler to a great extent, leaving room for the water to evaporate from the bed of the pocket; but immediately the blast was taken off, the iron and slag came back into the pocket, or the cooler was burnt on the immediate return of the iron, covering the water which was leaking from the cooler, or evaporating and decomposing the water into its constituent elements, hydrogen and oxygen, thus generating a mixture of highly explosive gases. Not only is there great danger by the decomposition of the water but a great absorption of heat in that particular part of the furnace where the heat is most needed, and where dependence is placed entirely upon carbon, and the carbon contained in the cyanides, for reduction.

Suppose, for example, a furnace working very economically, with the composition of the gases at the mouth or outlet having eight parts carbonic oxide in proportion to 1 of carbonic acid estimated from the actual carbon oxidized from the coke, the coke containing, say on an average 10 cent of ash and volatile matter, this would show a calorific value of

$$\frac{(2403+2403+8080)\ 90}{3\times 100} = 3865.8 \text{ units.}$$

The absorption of heat due to the decomposition of nine parts of water is 34462 units, which shows that for every kilogram of water that would enter the furnace

$$\frac{34462}{9} = 4940 \text{ units would be absorbed and } \frac{4910}{3865.8} = 1.277$$

kilograms of coke would be needed to supply this quantity of heat.

It is almost an impossibility for an explosion to take place in the tuyere itself, owing to the small area it contains when using a coil tuyere, so if water can be absolutely prevented from entering the furnace through a leakage from the tuyere, it follows that no explosion can occur, and it is claimed that by the vacuum principle, no water can under any circumstances find its way into the furnace through the tuyeres and coolers.

The average life of a tuyere on the pressure system at Darlaston was seven weeks, with the vacuum system it is rather more than eight weeks. The special coil tuyere used can be changed in five minutes. The supply tanks are regulated by an automatic bail valve.

In connection with the vacuum tuyeres, an electrical signalling device has been fitted up in order to show if a bad leak occurs. This consists of an ordinary vacuum gauge which makes an electrical contact at any point required, and thereby blows a whistle.

French Armor Plate Process.

A method of manufacturing armor plate has been invented by Georges Charpy, of Montlucon, France, who has obtained a patent in this country, which has been sold to Cie. Des Forges De Chatillon, Commentry Et Neuves-Maisons, of Paris, France.

By this process a result has been obtained different to that commonly obtained by the process which consists in uniformly hardening a plate or one of its faces on which the content of carbon has been increased by cementation. There is obtained by a single hardening and without annealing, the texture which is characterized by absence of fissility in all that part which is not cemented. In seeking this result, which is of importance from the point of view of the resistance of the armor plate to perforation, processes have been carried out comprising several successive operations of hardening. one of which is at least always difficult to realize and involves conditions which are different for the cemented parts and those not cemented, whether from the point of view of the temperature of heating or from the point of view of the speed of cooling. In contrast to these processes this invention presents the advantage that an analogous result is obtained by a single hardening at a uniform temperature, an operation easily to be realized. Moreover, the process enables cemented armor plates of any thickness and reduced as may be desired to be treated, since it is no longer necessary that different conditions obtain on the two faces.

According to Charpy's invention armor plates are manufactured from a metal whose composition is determined by the conditions that the metal must acquire by a single hardening, without subsequent annealing, a texture such as an armor plate must have if it is not to be fissile, and that the hardening at the same temperature must give to the metal after cementation a porcelain like texture and great hardness. The metal used by the inventor, and which realizes these conditions is an extra soft steel—that is to say, one containing not appreciably more than .15 per cent of carbon, to which has been added a portion of nickel amounting to five or six per cent. To this metal is generally added a proportion of chromium slightly higher than 0.5 per cent. which without modifying the peculiar property of the metal, improves the results obtained, especially in respect of hardness of the part cemented. When the armor plates have been made of the desired dimensions from ingots of this metal obtained by any known metallurgical processes, they are cemented on the face to be hardened by any usual method and are then hardened, the plate being uniformly heated at a temperature of about 750 degrees to 800 degrees, centigrade, and quenched, which imparts to the different parts the texture desired in the manufacture of armor plates.

Treating Steel With Hydrogen.

A NEW process for treating steel has been devised by Thomas Andrew and Thomas Bellis, residing, respectively, in Richmond and London. England. The salient feature of the process is the use of hydrogen as an element that will impart to Bessemer and open-hearth steel the qualities wanted. The affinity of this gas for metals is well known, and it appears that iron especially naturally contains it in greater or less quantity.

It is the idea of the inventors that one of the prime reasons why Bessemer and openhearth steels have not the high quality of crucible steel is that in the process of manufacture much of their hygdrogen is lost. They argue upon the following considerations viz.: first, since the heating of steel up to the molten condition means the forcing out of its gases while cooling, it means, at least up to a certain point of temerature, the re-absorption of gases, it is not extravagance to assume that even the hydrogen which remains after the metal has been put through extreme heats in process of manufacture would in the Bessemer and openhearth processes be attacked and burned by the atmospheric oxygen to which those processes permit it to be exposed and which it tends to absorb during the cooling stage, accounting in a measure for the phenomenon known as "recalescence" or that condition in the cooling metal where recurs a temporary glowing: second, because experiments by Prof. Arnold and others show that bubbles formed in openhearth and Bessemer steels are often bubbles of hydrogen; and, third, because the very salutary result which manufacturers of high reputation as experts in the art of steel making have obtained in practicing this process support the accuracy of their deductions. It is their object to treat Bessemer and open-hearth steels with a view to recharging them with the lost hydrogen, imparting the superior quality of steels made after the more cumbersome and tedious crucible process—a process in which at least no such undesirable combining of the hydrogen, and the carbon for that matter of the metal with atmospheric oxygen as is above referred to is permitted and where the loss of hydrogen, if any, is inappreciable.

In carrying out the new process. Bessemer or open-hearth bars or billets are first heated in an ordinary closed air furnace, subjecting them to a good soaking heat—i. e., a heat sufficient to appreciably open the pores or grain of the metal and slightly greater than that of the recalescent point. The billets when at a bright red heat—i. e., when their grain is apprecibly opened—are quickly withdrawn, laid on a suitable support on a sand floor, and at once covered with a suitable bonnet, into which is injected a jet of pure hydrogen. By contact with the metal the gas will be ignited, serving to effect the exhaustion of what air is initially inclosed in the bonnet with the billets. When the air is completely exhausted, the metal remains in a bath of pure hydrogen gas, which it freely absorbs. The metal remains exposed to the gas for fifteen minutes, or longer, if desired. When the metal cools, the hydrogen is not only retained mechanically on combination by the closing of the pores for grain of the metal, but chemically, for the hydrogen absorbed has combined with the carbon of the metal. At this stage, therefore, a union will have been formed between the iron, the carbon, and the hydrogen, the latter acting as a binder between the other two. The homogeneity of the union is, of course, materially enhanced by the thorough opening of the pores of the metal thus permitting perfect exposure of the carbon to the hydrogen: but the union thus effected has not caused the quality of the steel to be improved though the hydrogen is established in the composition with adequate tenacity, it requires a melting heat to bring about its separation from the metal after being once incorporated in it. The carbon which is a fugitive element under re-heatings and temperings, is neither fixed nor crystallized consistent with the superior quality which the product is intended to possess. To quite perfectly and crystallize the carbon, therefore, the steel is next chilled. This is effected by first heating the billets whether or not they have meantime cooled is not absolutely essential: to a white heat if they are of low carbon .10 per cent or .15 per cent or simply a red heat if they have above that percentage of carbon and to avoid danger of fracture when chilled their carbon should not be over .85 per cent, and then cooling them in any suitable and well-known chilling-bath which does not evolve oxygen, oxygen having, as is well recognized in this art, a deleterious effect on the steel.

IMPLIED WARRANTY

OF A MANUFACTURED ARTICLE.

EMANUEL T. PERGER.

IN the last issue the question of the liability of a manufacturer where he expressly warrants an article to be of a certain grade or quality was discussed. And now it is intended to recite a few interesting and important legal decisions concerning the liability of a manufacturer upon goods which although he has not expressly warranted in writing or otherwise, the law imposes upon him a presumption that because of the character of the article the warranty was implied. The general rule can be stated as follows: that when an article is ordered to be manufactured for a particuar use or purpose then there is an implied warranty that it is to be reasonably fit for such use or purpose. But when the article ordered was to be of a peculiar design or description, when defined and understood between the parties and the article was made in pursuance of the specifications, then no warranty is implied further than that it should be of good workmanship and material and should be well put together. In short it can be said that where a maker delivered an article just as it was ordered without regard to its use then he can not be held to have implied anything beyond the skillful making of the article. But there are many cases where manufacturers make an article which they advertise to be for a specific purpose. As for instance, a manufacturer of fire proof safes without any expressed stipulations can be said to have implied a warranty that his safes were reasonably fire proof inasmuch as they were sold for that specific purpose.

This is especially true of the manufacturer who makes a specialty of a certain article, that is, manufacturing it under a patent or under specifications which are not generally known. In a case of this sort the buyer relies to a great extent upon the skill and experience of the manufacturer to make the article purchased reasonably fit for the purpose for which it was bought. As for instance where a buyer writes to a maker stating that he wants an auger which will bore through very hard soil or rock. If the manufacturer should send him an auger which it was found would bore only in very soft soil, the buyer could not be made to pay for the article inasmuch as he had relied upon the manufacturer to send him the proper thing for this purpose and the filling of the order by the manufacturer carried with it a presumption that the thing sent was reasonably fit for the purpose for which it was ordered. This rule can also be said to apply to a manufacturer's new and comparativey unknown articles which are made, advertised and sold as an innovation and for a purpose to which they are not usually applied and concerning which the buyer can have nc experience and must rely upon the representations, to a great extent, of the manuafacturer. An example of this last class of cases recently came up in one of the lower courts in Michigan. An automobile manufacturing concern sold a steam automobile and had catalogues printed in which the automobile was pictured as traveling through heavy snow in the dead of winter. A concern wrote to this company stating that they had a great deal of outside work for their inspector during the winter months and if they could use an automboile, they would buy one. They were finally induced to purchase one, but no written guaranty was made concerning the ability of the machine to work in the winter time, but stated to the makers the purpose for which they needed it. When used in the winter time the machine was absolutely unfit for their purpose inasmuch as the various parts would freeze during cold weather rendering the machine useless. The machine was returned and suit brought for the purchase price. Upon trial the judge held that inasmuch as the plaintiff had many times stated to the defendant the particular purpose for which they desired to use the automobile adding that unless it could serve these requirements, the machine would be worthless to them. That having sold the machine to the plaintiffs for this specific purpose they could be said to have implied warranty that the machine would be fit for that purpose; and the plaintiffs won their case.

As this case did not go to the Supreme Court the decision was not an authoritative one but in the writer's estimation, the rule adhered to by the judge, was a correct one.

As an example of certain state of facts in the sale of an article in which a warranty is implied, the following decision will be interesting.

In a case decided by the Supreme Court of Iowa it appeared that one Blackmore ordered from Fairbanks, Morse & Company, of Chicago, one 25 horse power Standard Westinghouse engine and boiler complete, to be used in furnishing motor power for certain grist and flour mills, owned by Blackmore. The engine and boiler were so shipped but later turned out that for various reasons they were not suitable for mill purposes, and Blackmore refused to pay for the machines, contending that although there was no expressed contract as to exactly what the machine would do, that the manufacturer was liable upon an implied warranty that the machine would be reasonably fit for the purpose for which it was intended, especially as the manufacturer knew for what it was ordered.

The case went up to the Supreme Court of Iowa and the court decided that if this had been, a mere order for a machine giving certain descriptions and specifications without mentioning the purpose for which it was to be used, then the seller would not be responsible for a strict compliance with the terms of the order. But in this case the seller did know the purpose for which the machine was to be used and as the buyer had no opportunity to inspect the machine before purchasing, he had a right to hold the Fairbanks, Morse Company responsible that the machine would be reasonably suitable for doing the work in the mill. Blackmore was permitted to return the machinery without cost. As an additional fact of interest in this case, it was held that expressly stipulated guarantees in regard to a machine concerning other matters or qualities did not preclude an implied warranty for a particular purpose being set up even though it were not expressed with the other expressed warranties. The cases upon this subject are without number. In nearly every branch of the trade, these questions have arisen and it has been held to be for the protection of the buyer who has had no opportunity to personally inspect the goods. That where the seller knows the purpose for which the article sold is to be used, he must be honest enough to furnish an article which will not be worthless when received, even though it may seem to conform with the terms of the order.

PENNSYLVANIA'S BITUMINOUS FIELDS.

THE bituminous coal field of Pennsylvania embraces the Northeastern end of the great Appalachain series of the coal measures. It includes an area of about 12,200 square miles, lying chiefly in the Western part of the state, and spreading from Ohio, West Virginia and Maryland Northeastward to New York. The coal-bearing rocks cover practically the whole of Greene, Washington, Allegheny, Westmoreland, Beaver, Lawrence, Butler, Armstrong, Jefferson, Indiana, Clearfield and Cambria counties, and the greater parts of Fayette, Somerset, Elk, Clarion, and Mercer counties, besides part of Crawford. Venango, Forest, Warren, McKean, Cameron, Blair, Center, Clinton, Potter, Lycoming, Tioga and Bradford counties. Besides the main area, the Broad Top basin in Huntingdon and Bedford counties has an area of about 50 square miles, and is about 30 miles East of the Allegheny Front.

All available information regarding this, the most important of the bituminous coal fields of the United States, is summarized in Part III of the XXII Annual report of the United States Geological Survey, now in press, by Messrs. David White and M. R. Campbell, who have drawn largely for their material upon the report of the Second Geological Survey of Pennsylvania.

The principal commercially workable beds of the state are: the Sharon or block coal, whose commercial history dates from 1837, mined in nine counties; the Mercer or Alton coals, mined in twelve counties; the Brookville coal, mined in thirteen counties; the Clarion coal, mined in nine counties; the lower Kittanning, mined in seventeen counties; the middle Kittanning, mined in a few places: upper Kittanning coal, mined in twelve counties, the lower Freeport coal, mined in thirteen counties;

the Gallitzin coal, mined in five counties; the Philson coal, mined in three counties; the Bakerstown coal, mined in two counties; the Berlin coal, mined in Somerset county; the Elk Lick coal, mined in four counties; the Little Pittsburg coal and the Painter coal, mined in localities; the Pittsburg coal, mined in six counties; the Redstone coal, mined in four counties; the Redstone coal, mined in four counties; the Sewickley coal, mined in three counties; the Uniontown coal, mined in three counties; the Waynesburg coal, mined in three counties; the Washington coal, mined in two counties.

The Sharon block coal, strong, free from sulphur and valuable for furnace use near the Ohio line, becomes dirty, sulphurous, patchy and of little value to the Eastward. The coals of the Mercer group, dirty, and of little account Westward, are locally very free from sulphur toward the Northeast in Tioga, Lycoming, and Bradford, where the celebrated Bloss coal is highly valued for forge and domestic purposes and produces from 73 to 82 per cent of coke near Blossburg. The Brookville bed, in Jefferson county and along in the Allegheny slopes, is serviceable only as a somewhat sulphurous heavy steam coal; but in the Broad Top basin, in Huntington and Jefferson counties, it is proving a valuable steam fuel and has been coked. The lower Kittanning coal, mined to a small extent for steam purposes in the Allegheny Valley, is a valuable coking coal in Northern and Eastern Clearfield county, in Eastern Cambria county, and in Blair county. In the Eastern region it is also locally important as a smithing coal, and is a valuable heavy steam coal in the Broad Top field. The upper Kittanning, of minor value for steam and gas purposes in the Western districts, becomes of some importance as a steam and domestic fuel in parts of Clearfield, Cambria and Somerset, and makes a good coke in the Snow Shoe basin of Center county. The lower Freeport coal, mined in Southern Elk, Eastern Jefferson, Northern Indiana, in the Shawmut-Reynoldsville-Punxsutawney basin, and in Northern Cambria and in Eastern Clearfield county to the Moshannon Creek, in the Philipsburg-Houtzdale basin, is especially valuable for high-grade steam, gas, and coking purposes, and also for smithing and puddling. The upper Freeport coal, mined chiefly in the lower Allegheny and Kiskiminitas valleys to the West and near the Allegheny slopes on the East, in Armstrong, Westmoreland, Indiana and Cambria counties, is used as a steam coking coal. The great Pittsburg coal is adapted to high-grade steam, smithing, and rolling mill use in Somerset county; and to steam and railroad uses in Southern Indiana county. In Eastern Westmoreland and Fayette counties it is the source of an enormous coking industry, and farther Westward it is especially valuable as a gas coal. Everywhere it is a very high-grade steam coal. The greater part of the Connellsville coke is shipped to the furnaces of Western Pennsylvania.

The Pennsylvania beds of the Appalachian coalfields were the first to be commercially developed. The earliest record of coal mining in the Pittsburg region is that supplied by Captain Thomas Hutchins, who visited Fort Pitt, now Pittsburg, in 1760, and found a coal mine opened on the opposite side of the Monongahela river.

With the advent of the first steam engine in Pittsburg in 1794, the demand for the new fuel increased, and by 1800 a number of mines were in operation on both sides of the Monongahela river, and coal was used quite extensively in salt works, glass factories, and for general purposes. The first coal was shipped from Pittsburg in 1803.

As early as 1804, barges with coal for sale were loaded in Clearfield county and floated down the Susquehanna to Columbia in Lancaster. By 1825 it is reported that about 3,500 tons were used in the vicinity of Pittsburg. This local consumption increased to 464,000 tons in 1846, in which year 214,000 tons were sent down the Ohio river, and 53 steamboats were built for the river trade. The next year 56 boats were added to those already in use. About 1842 the Blossburg basin, Tioga county, began commercial shipments, and the development of the Barclay basin, Bradford county, followed not long after. The use of the Sharon block coal in the furnaces of Mercer county is said to have begun in the same decade. The rapid exploitation of the coals in Cambria county dates practically from the time of the construction of the State Portage and the Pennsylvania railways. The remarkable development of the Reynoldsville basin began soon after the construction of the Low Grade division of

the Allegheny Valley railway in 1872. The development of these fields is eclipsed by the wonderful progress made in the size and number of plants and in the increased production of coke in the Connellsville and adjacentt basins in the past forty years. From less than 100 ovens in 1860, the field has grown to about 25,000 ovens in 1901.

The bituminous coal production of Pennslyvania has increased from an estimated output of about 1,000,000 tons in 1847 to over 42,000,000 tons in 1890, and to the immense total of over 79,000,000 tons in 1900. The production of coke in 1900 was, according to the state records, over 12,000,000 tons. Somewhat more than one-half, or nearly three-fifths, of the bituminous production of the state in 1900 was derived from the Pittsburg coal, the remainder, about 40 per cent, being derived chiefly from the lower Kittanning and the two Freeport coals. The number of bituminous collieries in Pennsylvania, as listed by Mr. Baird Halberstadt in 1892, was 706. The list published by the same author in 1901 includes 935 names. The number of new mines opened in 1900 was 175; the number of mines abandoned was 28; the number of mines re-opened was 6. The districts of most rapid development within the last dceade include Cambria and Somerset counties, Northwestern Indiana county, the Shawmut basin of Southwestern Elk county, the Pittsburg coal region of Southern Allegheny and Northwestern Fayette, and the Connellsville basin of Westmoreland and Fayette counties. In 1892 the number of mines was: 88 in Allegheny, 85 in Fayette, 92 in Westmoreland, 122 in Clearfield, 76 in Cambria and 19 in Somerset—a total of 482. In 1901 there were 99 in Allegheny, 117 in Fayette, 188 in Westmoreland, 127 in Clearfield, 130 in Cambria, and 53 in Somerset a total of 714. The indications point to a rapid extension of mining operations in the near future. Mr. White thinks it not improbable that the great Pittsburg bed may eventually be worked at sea level. There are as yet no "deep" mines in the bituminous basins, all but a small percentage of the mines being worked by drift on the outcrop or by gentle slope down the dip of the bed. The room and pillar system is used in most mines of the region. A large proportion of the mines use machines for mining, and many of these machines are driven by compressed air. The Pennsylvania coal and its coke product are distributed by the trunk lines of railway to the Atlantic, to the Great Lakes, and into the Western interior, and by the Ohio river to the South and to Gulf ports. The reports indicate that the present capacity of the existing mines is from 25 to 50 per cent in excess of the current production. The average number of days of operation of the mines during 1900 varied from 181 in the eighth inspection district to 261 in the ninth district. In general, the steadiest operation was in the coking districts. The average period of operation during the year for the entire region was 219 days. The cost of mining in the bituminous fields varies greatly in different areas, the rates being governed primarily by the thickness and structure of the bed, though they are also affected by the general geographic location, and by the relations of the mine to the wage-scale districts. The cost of production of coal f. o. b. cars varies apparently from about 47½ cents to $1.30 per ton which figures do not seem to be reliably suggestive. The number of men engaged in and about the mines in 1900 was 109,018, each of whom produced an average of 727.5 tons of coal during the year.

A Portable Converter.

An apparatus for treating metals has been invented by George C. Carson, of Redding, California, to provide simple portable mechanism which will permit the conversion and refining of metal without the necessity of expensive plants. His idea is to employ a blow pipe through which jets of steam, air, or gas may be introduced into molten metal.

The receptacle for the metal may be of any well known form, such as crucible, open-hearth, or the like. A hose is provided which leads to any suitable supply from which the current for reducing or for oxidizing is derived. This hose is coupled to a pipe having a right angled turn, or if preferred, such pipe can be formed into a coil instead of an angle, to provide some additional heating surface, which can derive heat from the receptacle below. A cock regulates the current. Upon the

end of this pipe is threaded a sleeve, made preferably of iron and provided with an internal screw thread. Engaging with this thread is an expansive bushing made of metal having greater expansion than that of the external sleeve, such as brass, and having one or more incisions and also having a head by which the bushing may be turned. This expansive bushing is the holder for the blow-pipe or jet, which is preferably a hollow tube of hard carbon, projecting from the holder down into the contents of the metal receptacle. When the head is turned to screw in the bushing, it compresses a ring or washer of absestos or other suitable material, between itself and the end of the sleeve which makes a tight joint. The carbon jet pipe is of sufficient diameter to provide for a central bore for the passage of the current. This bore is preferably terminated short of the end of the carbon and then there is provided two or more intersecting passages for discharging the current sidewise. The bore may, however, continue through to the end, if desired. A metal sleeve is inserted in the hollow carbon, terminating short of the end of the bore in it, and is split and lapped, so that it can expand without affecting the carbon.

In operation the carbon jet is inserted into the metal and the reducing current or oxidizing current is forced under pressure through the hose. It is preferable to use a simple adjustable support for the apparatus and with a single receptacle one can be employed, or two, or as many of the blow pipes as may be required. By a reducing current of hydrocarbon vapor a melting heat can be obtained in the receptacle for melting scrap, etc., for raising the temprature of metal previously melted. An oxidizing current of air or steam is used to expel impurities in the molten metal and in transforming cast iron into malleable iron or steel. The carbon jet is peculiarly adapted to the purpose on account of its exceedingly refractory nature and slight range of expansion.

The carbon-holder is very simple in construction and the replacing of carbon tubes is accomplished with great facility. The great expansion of the split metal sleeve as compared to the carbon causes it to clamp the carbon more firmly as the temperature increases while the packed joint used prevents any leakage of air, steam, or vapors.

Gas Power Plants for Mining Districts.

GAS-POWER outfits for mining and smelting plants operate to the best advantage under the following conditions—when fuel cost is high; when wood, bituminous or anthracite coal are the fuels, and when water is scarce or of poor quality for steaming purposes.

With plants of 250 H. P. or more under everyday working conditions one brake H. P. per hour is produced with from 1.25 to 1.5 pounds of bituminous or anthracite coal, or with three pounds of wood. The consumption of water need not exceed two pounds per B. H. P. per hour.

The steam from a good boiler plant represents about 70 per cent of the heat developed by the combustion of the coal, and as a good steam engine is able to deliver about 14 per cent of the heat of the steam power, we have a total efficiency of about 10 per cent. The gas from a power gas plant, on the other hand, contains over 80 per cent of the heat in the coal, and a gas engine delivers 25 per cent of this gas power, making the total efficiency 20 per cent.

A gas-power plant using wood for fuel shows the same ratio of saving as with coal, from 2 to 2.25 pounds of wood being equal to one pound of coal. The wood is used in 2 or 3 foot lengths and of ordinary cordwood diameters. The heating value per pound of all varieties of wood is about the same, so that the kind of wood need not be considered when the estimates are based on weights.

Gas-power plants involve two processes,—first the conversion of the fuel into gas; and, second, the combustion of the gas in the cylinder of the engine developing the power. The cheapest gas suitable for power that can be furnished is made from coal, either bituminous or anthracite, coke, or wood, by passing air and steam either alternately or together through deep beds of incandescent fuel. The resultant gas is passed through scrubbers, or towers with water sprays, to holders of moderate size. The apparatus is simple, safe, and easily operated.—Hawley Pettibone, in Cassiers' Magazine for May.

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EDITORIAL COMMENT.

The Scope Outlined—What may be reasonably expected from the immediate future of the United States Steel Corporation has been outlined in the circular sent out by the general directing officials of the concern. The European iron and steel centers have been disturbed in mind for a long time and their anxiety was heightened by the recent visit of President Charles M. Schwab to the different countries of the continent. The American producers not embraced within the Steel Corporation were no less anxious as to what might be the scope of operations of the combination and its possible effects upon the iron and steel industries in this country. The more favorable conditions here were slightly reassuring, especially as the combination had not so far given an intimation that it proposed to introduce a process of wiping out the less favored producers. Still the anxiety clung until the plans of the big concern should be made plain.

The circular given out last week leaves little to the imagination. The fact is made plain that the Steel Corporation intends to so increase its producing capacity under modern equipment that the economies will be of the closest. Coupling the gross increase in the producing capacity in the form of equipment that will be added to the concern's plants, brings into bright prominence the fact that the Corporation proposes to take complete control for the metal industries. This control will apply not alone to the United States but to all parts of the world. With the tonnage of production which the Steel Corporation controls now, there is no single force, indeed no force, which, combined in the iron and steel world, could forestall the Steel Corporation either as to merits of products or low limit on prices. What may be expected of any possible opposition force in iron and steel production when the Corporation has added the proposed extensions to plants and the addition of more modern equipment? When the present period of business expansion has passed, as it will within reasonable time, the period of low prices will obtain again, and if the United States Steel Corporation does not amaze the whole world with its low prices to capture the business of the universe in iron and steel the amazement will be even greater.

Increasing the Iron Output—The plans that have been made recently for the building of several new blast furnaces, North and South, which when completed and in operation will yield an increase of from 5,000 to 6,000 tons of pig iron daily to the aggregate of current production which will run close to 20,000,000 tons, perhaps 1,000,000 more, is a clear cut illustration of the trend of the steel industry in the United States. The advances which have been made in increasing the production, at the same time lowering the costs to consumers, while commendable, will fall short of the strides of the next decade. Since 1890 the world has watched with anxious interest the rapid forward movement in the United States but the activity of the next ten years will be even more rapid.

In the case of the new furnaces that are projected, the plans are simply to meet the current demand for prompt iron and it is extremely probable that before the furnaces now planned are in blast, as many more will be under way to meet the possible demands of the immediate future of that period. To establish a blast furnace system that should at all times be in position to maintain a condition of ease in the iron and steel trades, the tonnage would have to be increased to an extent almost incredible. The furnaces spoken of are simply the beginning of an extension of the blast furnace system of the United States, and only a small beginning, for, if the demand of the next five years should not rise above the current demand for iron, the supply would still be insufficient to maintain an easy feeling in the markets.

The American Sheet Steel Company is preparing to make extensive improvements to the Old Meadow rolling mills in Scottdale, which have been in operation for some two years, and which refused to close down when the Amalgamated Association ordered a strike last summer. The Scottdale mills, in the same town, are also to be improved. The improvement consists in labor saving devices and an increased output. Electric power is to be introduced in many of the departments where steam has been used, and the plants are to be modernized.

PERSONAL MENTION.

Victor Beutner, who for some time has been connected with Julian Kennedy in the engineering department, has opened an engineering office in rooms 1211-12-13 Westinghouse building, this city, where special attention will be paid to the designing and building of blast furnaces, steel works, rolling mills, etc. Mr. Beunter has just taken a contract to design and build a new pipe mill for the Susquehanna Iron & Steel Company, at York, Pa., which will be built on the most modern plans. The buildings will all be of steel structure and will contain three lap weld and one butt weld furnaces. All the machinery equipment is to be electrically driven, the power plant aggregating 800 kilowatts. Among the equipment needed will be 40 to 50 pipe cutting and threading machines, engines, boilers, four electric traveling cranes ranging in size from 5 to 15 tons capacity, etc.

W. C. Marbon, a file manufacturer of Birmingham, England, was in Pittsburg a few days ago. "One of my principal reasons for coming to America this time," he said, "was to look at some labor saving machinery for turning out files. Files are now made by machinery by some manufacturers, and I have used machinery in my establishment, but the product is not so good as the handmade article, and I have not seen anything yet that will do the same as the workmen. I employ 115 men and could do a large business in America were it not for the high duty. It may seem strange, but it is a fact, that in England we can buy Pittsburg steel cheaper than the English make."

Harry Parrock, superintendent of the upper mills of the American Steel Hoop Company, Youngstown, O., has been appointed superintendent of the Brown-Bonnell plant of the Republic Iron & Steel Company. George M. Summers, superintendent of the Brown-Bonnell plant, is made superintendent of the Valley plant of the Republic company. He succeeded George H. Lowe, who has been made superintendent of the Muskegon, Mich., plant of the American Rolling Mill Company. George Huggins will be assistant to Harry Parrock at the Brown-Bonnell plant. The changes will become effective May 1.

At the annual meeting of Jones & Laughlins, limited, the election resulted in the choice of all the present officers of the company. These are: B. F. Jones, chairman: Willis F. King, vice chairman; Irwin B. Laughlins, treasurer; William C. Moreland, secretary; William L. Jones, general manager, and Thomas K. Laughlins, assistant treasurer. The board of managers elected consists of B. F. Jones, Jr., Willis L. King, Irwin B. Laughlins, William C. Moreland, William L. Jones, James B. Laughlins, Roland Gerry and Thomas O'C. Jones.

W. E. Corey, president of the Carnegie Steel Company, and William Dickson, assistant to Charles M. Schwab, president of the United States Steel Corporation, and a number of superintendents of the National Steel Company's plants made a tour of inspection of plants at Sharon, Youngstown, Warren, Bellaire and Columbus, O., last week.

John M. Franklin, has been appointed general manager of the mining operations of the Tennessee Coal, Iron & Railroad Company. He was formerly assistant manager of the Rainey Coal & Coke Company, of Connellsville. He succeeds Erskine Ramsey, who retired from the company a year ago.

John Smith, Youngstown, O., has accepted the superintendency of the mills of the Colorado Fuel & Iron Company, Pueblo, Col. Mr. Smith was for a number of years at the Ohio works of the National Steel Company, but lately he has held a responsible position with Jones & Laughlin, this city.

J. W. Shook has taken charge as manager of the Ensley furnace division of the Tennessee Coal, Iron & Railroad Company. All five furnaces of the company at that place are in blast and eight of its ten steel furnaces at the steel plant are in operation.

Paul L. Wolful, chief engineer of the American Bridge Company of New York and Albert Major, president of the American Bridge Company of New Jersey, are in New York in conference with the officials of the concerns.

Adrian Weaver, Allentown, Pa., has been appointed to the superintendency of the Allentown furnaces of the Empire Steel & Iron Company.

J. Morgan has been appointed master mechanic of the Ensley furnace division of the Tennessee Coal, Iron & Railroad Company, vice C. V. Norris resigned, effective May 1.

O. T. Adams, superintendent of the Shelby Steel Tube Company, has handed in his resignation to take immediate effect.

The Harrisburg Pipe & Pipe Bending Company, Harrisburg, Pa, is about to expend $30,000 in addition to its plant. Two new buildings will be erected. They wil be one story high and will be of steel construction.

IN AND ABOUT PITTSBURG.

A meeting of the recently organized Monarch Iron & Steel Company was held in Pittsburg this week and a permanent organization effected. The plant of the company at Parkersburg, W. Va., is nearing completion and will be ready for operation by July. The product will be planished iron sheets, under the patents of G. C. Broomall, of Cincinnati. The officers of the company are president, S. M. Nease; vice-president, Kelab Brcomall; secretary, E. M. Whippo; treasurer, G. C. Broomall; manager, J. R. Rcse, who with T. C. Perrine, of Pittsburg, and William Pyle, of Wilmington, Del,. comprise the board of directors. The company is capitalized at $100,000.

Work is progressing rapidly on the construction of the plant of the recently organized McKees Rocks Manufacturing & Foundry Company, McKees Rocks, and it is possible that it will be ready for operation by June. The initial building is about completed and the machinery will arrive in a few days. The plans of the company outline an extension to the present building to increase the floor space by 200 per cent. The company will manufacture a combination hoisting jack, under the patents of John T. Haskin, of the company, hoisting engines, and mill and machinery castings.

Dravo, Doyle & Company, who have the Pittsburg agency for the Sorge-Cochran system of water purifying and feed water heating, report the following among recent installations: 2,000 horse power system for the Demmler plant of the American Tin Plate Company; 2,100 horse power system at the New Kensington plant of the Pittsburg Reduction Company; and a twin system in the Union station power plant of the Pennsylvania Railroad in this city.

A new addition is to be built at the works of the Sanitary Supply Company, at New Castle Junction, in the near future. Materials for the construction of a number of the proposed improvements have already arrived, and the work will be begun within a few days. The principal addition that is to be made at the plant comprises the building of two new kilns for burning the ware and the construction of a very fine new stock and storage room.

The Mechanical Locomotive Stoker Company has been organized at Franklin by General Charles Miller and C. J. S. Miller of that place. The capital stock is $1,000,000 of which $500,000 will be 7 per cent preferred cumulative stock, par value $100. The remaining $500,000 will be common stock of the same par value. Contracts for the buildings and the machinery equipment will be awarded shortly.

Major James E. McNary, well known in engineering circles, has established offices in the Empire building, this city, where he will handle a full line of steam specialties, including the Hamilton-Corliss engine, made by the Hooven Owens & Rentschler Company, Hamilton, O., the Franklin water tube boiler made at Troy N. Y., with gas engines, air compressors, etc. Mr. McNary will represent the Washington Company, Inc., New York city.

A temporary organization of the Iron City Spring Company has been effected by George M. Hosack, John A. Murphy, Harry R. Easton, Samuel M. Myers, and Chauncey Lobinger, 1109 Park building, and an application for a charter will be made May 20. The company will form a permanent organizaton May 20, and outline plans for the building of a plant to manufacture springs.

An application for a charter will be made May 2 by the Lawson Manufacturing Company, of Homestead, with $25,000 capital stock, for the purpose of manufacturing gas-stoves and ranges burners, water heaters, etc. The company is equipping a three-story building in the rear of Eighth avenue, Homestead. The incorporators are Lindley S. Lawson, William H. Mailey and William H. Johnson, all of Homestead.

Considerable of the lumber that was intended for use in the constructon of the new buildings at the Hartman Manufacturing Company's works in New Castle, is being shipped to Ellwood City. This move has given rise to a rumor to the effect that the works to be removed back to Ellwood City.

It is possible that in addition to the building of a bridge plant at West Pittsburg, near New Castle, contemplated by the Garland Chain Company, that the chain plant of the Garland Company will be removed from Braddock to the new town and enlarged.

The Kidd Brothers & Burger Steel Wire Company, McKees Rocks, manufacturers of cold drawn tool steel, contemplates an extension to the plant and the installation of machinery to increase the present output.

The Wheeling Mold & Foundry Company, Wheeling, W. Va,. has added aother roll furnace to its Peninsula plant. The company reports a heavy demand for sand and chilled rolls.

James McKay & Company, chain manufacturers, are preparing to add 25 forge fires to their plant at McKees Rocks. The company at present is operating 75 fires.

The rail mill of the Edgar Thomson steel work of the Carnegie Steel Company at Braddock resumed operations in full yesterday morning, after a shut-down of several weeks. The most important improvement made was the installing of a large engine to operate the rolls. For the past 10 years it has been used to make all rails of less than 45 pound pattern made by the company. The present improvements will enable the mill to make rails of every weight and it will be used on large pattern rails when orders are rushed.

An application for a charter will be made this month by the S. Severance Manufacturing Company with $500,000 capital stock. The company will succeed S. Severance, in the manufacture of spikes and rivets. Work has been started on a 100x200 foot addition to the plant of S. Severance, at Glassport, which will be used almost exclusively in the manufacture of boiler rivets of a high grade open-hearth steel. Most of the equipment for the addition has been purchased. The main office of the company is located in the Murtland building, this city.

The Pope Cement & Brick Company, of this city, has closed a deal for the bluestone quarries located near Dunbar, and will shortly arrange to develop a new industry there. The company proposes to install a lot of stone crushing machinery and other equipment for turning out crushed stone for railroad ballast and for foundation work. The plans call for an average shipment of 600 tons of this material a day from the quarries.

The Brown & Zortman Machinery Company, this city, was awarded the contract for the entire mechanical equipment of the plant of the recently organized West Virginia Bridge & Construction Company, Wheeling, W. Va. Business the past month is reported by the company to have been in excess of any month in the history of its business. The floor space at the company's show rooms, corner of Wood and Water street's, has been increased one-third and arrangements are being made for a warehouse to store new and second hand machinery.

Work has been started on a 20x80 foot three-story addition to the plant of M. Lanz & Sons, Carson street, South Side, which will be used as a warehouse. The present warehouse will be used as an extension to the manufacturing department. The company is engaged in the manufacture of bolts, nuts, washers, spikes, rivets, and hinges. New machinery will be added.

A company is being organized at Altoona which will build a plant for the manufacture of an automatic lubricating device to be used in air brakes, the invention of Peter Beahm, of Altoona.

The Dougalss-Whistler brick plant at Vanport, will be enlarged by the addition of a 15-kiln plant with a capacity of 50,000 firebrick per day.

The Standard Sanitary Manufacturing Company, of this city, has a contract for bath tubs, etc., for shipment to St. Petersburg.

NOTES OF THE INDUSTRIES.

The Marine Iron Works, Chicago, is running full in the new shops with new and remodeled equipment and plant. A contract has just been closed for machinery for the Tabasco-Chiapas Trading & Transportation Company one of the extension commercial companies doing business in the tropics. Among other notable pieces of work is the complete equipment of a river steamer for the Zaragoza Mining Company, of Columbia. Several steel boats are also under contract to be erected according to the ingenious plan of "knock down" construction which the Marine Iron Works has developed.

The David Bradley Manufacturing Company has made extensive improvements at the works at Brakley, Ill., during the past year, and further increases are contemplated Two buildings, one 80x100 feet, and the other 40x100 feet, three stories, have been added and the power plant has been increased from 500 to 1,000 horse power. Work will soon begin on a building 80x400 feet, three stories, for manufacturing and warehouse purposes. The factory is running full force, day and night, with all the men who can be hired.

The C. O. Bartlett & Snow Company, Cleveland, Ohio, has recently increased its capital for the production of hoisting, conveying, mill and cement machinery, and has bought a large plant which will be occupied as soon as possible. The company is building fueling outfits for the National Dock Fuel Company, and for M. A. Hanna & Company, Cleveland; dryers, conveyors and elevating machinery for the Southwestern Portland Cement Company, Kansas City, and drying and pulverizing outfit for the Indinapolis water works.

Work is progressing rapidly on the new plant of the Norwalk Iron & Steel Company Norwalk O. The material for the boiler house and gas

producing house will arrive this week, and both houses will be completed before the end of May. The steel for the main structure will arrive in Norwalk by June 1, and the building will be erected by the first of July.

The Macungie, Pa., furnace was recently changed with a combination of stock for malleable iron. The record was broken last week as regards quantity produced. In one run of 24 hours 70 tons of excellent stock was cast. Heretofore about 60 tons was regarded as the maximum limit for one full day. The furnace also surpassed the weeks, record in casting 478 tons. The best week's record heretofore was 368 tons.

A few days ago the blowing cylinder of the big engine at the Macungie, Pa., furnace burst. The cylinder is split open from top to bottom. The accident necessitated the stopping of the engine, and the furnace being left idle without air for the hot blast, the emptying of the stack was necessary. It is expected that it will take about six weeks until a new cylinder can be secured and put in position.

Robert C. Neal, of Harrisburg, Pa., has purchased the Hollidaysburg and Gap Iron Works, at Hollidaysburg, Pa. The plant has been idle for some time past but the new owner wil have it fitted up immediately and will resume operations, giving employment to 300 men. The plant was formerly leased and operated by the Eleanor Iron Company, at Pittston, Pa.,

The Edison cement plant at New Village, N. J., near Phillipsburg, will be ready for operation by June. The entire plant will be run by electricity, 125 dynamos having been installed for furnishing the current. When the plant is in operation Mr. Edison's devices will enable the company, it is said, to turn out more cement than any mill of its size.

A charter has been issued to the American Bolt & Machine Company, of Ottawa, O., for the purpose of manufacturing bolts and locks. The capital stock is $100,000, of which $60,500 has been subscribed and paid in. The incorporators are A. H. Poe, E. R. Post, C. H. Rice, H. L. Crowfis and G. W. Risser, all of Ottawa, Ohio.

The C. W. Hunt Company, New York has secured a contract for the coal handling equipment to be installed in the new United States government coaling station to be constructed in the Philippine Islands. The Hunt company has also received a repeat order from the United Railways & Electric Company, Baltimore, for electrical hoisting machinery.

The Deming Company, Salem, O., manufacturers of pumps and hydraulic machinery, owing to increase of its pump business, has been hampered for foundry room, and is preparing plans for an addition 60x80 feet. Heretofore much of the heavy work has been sent to other foundries, but now the company will do all its own work in this line.

The Delaware & Hudson Coal Company, Wilkesbarre, Pa., has purchased the Pine Ridge & Laurel Run colloeries of the Algonquin Coal Company. The Delaware & Hudson Company take charge today. The Pine Ridge has an output of 225,000 tons a year, and the Laurel Run an output of 125,000 tons.

The Lebanon Iron & Steel Company, Lebanon, Pa., recently incorporated by Paul H. Dennison, Ha ry M. Kurtz, William S. Stokes, William H. Triol and J. W. White, of Philadephia has purchased for $250,000, the Lebanon rolling mill plant. The company will ereet additional mills and manufacture wrought iron and steel tubing and pipe.

The Niles Galvanizing Company, of Niles, Ohio, has been incorporated for the purpose of manufacturing galvanized iron. The company has $10,000 capital stock, but that will soon be increased. The incorporators are H. J. Robbins, George B. Robbins, F. C. Robbins, W. H. Smiley and F. W. Stillwagon.

The Link Belt Machinery Company, Chicago, is figuring on a large coal handling plant for the Calcutta docks, India. Two of the company's engineering experts are on their way to that part of the world. The contract will include the construction of warehouses, etc., and will mean the purchase of over 2,000 tons of structual steel.

The Atlas Engine Works, Indianapolis, Ind., has increased the capital stock for the purpose of providing means to enlarge the plant The stock has heretofore consisted of $350,000 preferred and $200,000 common. The increase is to $1,000,000 each of preferred and common.

The Durham furnaces, at Durham, Pa., have been re-lighted and will be operated by a new company composed of Jerome Keeley, president, Philadelphia; Col. John Jamison, vice-president, Quakertown; A. F. Baker, secretary and treasurer, Quakertown.

The entire plant of the Champion Iron Company, Kenton, O., was destroyed by fire lately causing a loss of $250,000. It is not certain whether the plant will be re-built at Kenton as offers have been received to erect the works elsewhere.

The Colonial Ice Company, Cleveland, O., has been organized by Messrs. M. J. and C. J. Cline, who will erect a 40 ton ice plant on Woodland Hills avenue.

A meeting of the board of directors of the Tidewater Steel Company, Philadelphia, Pa., is called for May 7 to take action on a proposed increase of the capital stock from $1,500,000 to $2,100,000.

The Ohio Malleable Iron Company, Columbus, O., has been organized with a capital stock of $150,000 by Frank K. Newman, John D. Cochran, Sherman Leach, K. W. Holmes, F. H. Price and others.

A number of men have been put to work to place the the plant of the Burgess Steel & Iron Company, Portsmouth, O., in proper shape for operation. Many improvements are to be made to the works and the capacity increased.

A new corporation, composed of Philadelphia and Pittsburg capitalists has bought all the sand manufacturing plants located at Mapleton, Pa., and will operate them, beginning May 1.

Furnace No. 5, of the Allentown Iron Works, Allentown, Pa., was blown in a few days ago for the first time since May 15, 1901. The furnace has been leased by the Crane Iron Works.

The Wilmington, (Del.,) Manufacturing Company will soon build a three-story brick building 50x150 and 45x45 feet; a one-story building, 45x90 feet, and a one-story boiler house, 32x36 feet.

The Buckeye Fire Brick & Clay Company, Scioto Furnace, Ohio, intends to add largely to the capacity of its plant, erecting several more kilns and installing another grinding pan.

Kendrick & Company, Philadelphia, have been granted a permit to build a two story brick machine shop and boiler house, 50x125 and 20x 29 feet, for E. G. Insinger, of that city.

The Schuylkill Coal & Iron Company, Scranton, Pa., has been organized by E. A. Bartl, W. R. Teeter and T. Ellsworth Davies for the manufacture of iron and steel.

A valve and boiler house is to be built at the United States Improvement Company's Germantown station, Philadelphia, Pa. It will be a one-story brick building 60x35 feet.

A pattern shop and storehouse is to be built at the League Island Navy Yard, Philadelphia. It will be a one-story brick structure, and will be known as Building No. 19.

Because of the strike at the McClintic-Marshall construction works, Pottstown, work was stopped on the erection of the new steel plant at Birdsboro, Pa.

Employes at the Exeter Machine Works and the Vulcan Iron Works, at Pittson, Pa, have been given an unsolicited advance of 10 per cent in wages.

The Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio, has large contacts on hand for turbine and pumping outfits for shipment to England.

The Tabor Manufacturing Company, Philadelphia, has recently taken several orders for molding machines for shipment to England.

Baldwin Locomotive Works, of Philadelphia, has an order for twenty-two locomotives for the Danish state railways.

The rail mill at the Ohio plant of the National Steel Company, Youngstown, O., resumed operations this week.

The West Jersey tube works, Bridgeton. N. J., has increased its capital stock from $250,000 to $500,000.

Extensive repairs are being made to No. 1 furnace of the Warwick Iron Company, at Pottstown, Pa.

The Crowell Clutch & Pulley Foundry, Westfield, N. Y., was destroyed by fire Saturday last.

Moline Plow Company, Moline, Ill., has begun operations on a $50,000 addition to its plant.

An engine manufacturing plant is a proposed industry in Schuylkill Haven, Pa.

Will Build at Tarentum—The Railway Steel Casting Company has bought 20 acres of ground at Tarentum from the Philadelpia Warehouse Company for $30,000. It will build a steel casting plant of six buildings the main one 340 feet long and 140 feet wide. The company will manufacture all kinds of finished and unfinished steel forgings, producing 1,000 tons a month. The buildings have been staked off, grading will start at once, and it is hoped that the plant will be in operation by November 1.

Supreme Justice W. P. Potter, George W. Eisenbeis of the Federal National Bank, C. C. Smith, president of the Union Steel Casting Company, and S. H. Church, assistant secretary of the Pennsyvlania mines, are the principal promoters of the new company.

The Union Steel Casting Company, with works at Sixty-first street and the Allegheny Valley railroad, and in which several of those interested in the new Tarentum enterprise are heavy shareholders, months ago planned to double the capacity of the works. The necessary additional ground was purchased but the difficulty of securing the required structural steel for the buildings promptly caused a postponement.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The quietness is becoming more certain daily. The rush and excitement to obtain material under any conditions have subsided leaving considerable tonnage unsold for the last half of the year. Singularly, neither buyers or sellers appear to display any stirring interest for deliveries for the late months of the year. Probably the reason for this is that the consumers see now that there is no occasion for nervousness, since, with the worst of the crush over at least in the presentation of demands for urgent material, there is certain to be enough to go around, hence the future may be safely trusted to take care of itself. However, the excitement has entirely disappeared and deliveries are running along with more or less satisfaction. The railroads have made a striking improvement but the steel mills could use more cars if they were available. But there is an absence of the congested conditions of only a few weeks ago and it is improbable that there will be a return this year. The ease now is more even than was regarded as possible for any portion of this year, a few weeks since, but an almost complete covering of necessities has shown the consumers that there is enough for all if the demand is not for spot deliveries.

The pig iron market is quiet through force of circumstances as there is no iron for sale within the next three months except the usual wheel barrow lots that are to be found at all times and under all conditions. For deliveries late in the year the quotation is $18.50 for standard Bessemer, at valley furnace, while for prompt shipment, say within 30 days, the figure rises to $20 and $20.50 at furnace, equivalent to a maximum of $21.25 at Pittsburg. Mill iron runs closely at $20, Pittsburg. Billets which are still practically out of the market except for the stocks turned out by the independent producers may be quoted at almost any figure not below $33 for Bessemer, with a maximum of about $34.50; while for open-hearth the value is almost that of gold. Sellers may name their own price so that quotations in general are almost meaningless.

In the finished products the whole active movement is confined to urging the production to the mechanical limit in rushing deliveries. Shipments on sheets, bars, rails and structural are far behind but the mills are making slow gains. With a maintenance of the railroad promptness the steel mills will have made heavy inroads on the piles of stock in the yards of plants by July 1.

CURRENT QUOTATIONS:

Basic	$20 25		Splice bars	1 50	
Bessemer		20 75	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 60	1 7[illegible]
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 [illegible]
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	32 50		No. 1 cast	17 00	17 50
Open hearth	34 00		Iron rails	25 00	[illegible]
Steel bars	1 80		Car wheels	18 00	19 00
Iron bars, refined		2 00	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—The situation in iron and steel appears to gain strength all the time. Transactions have not been specially important during the past week, but they have been large enough to show that an enormous amount of material is being consumed, and the chances of a reaction are too small to enter into serious consideration.

Sales in the local pig iron market are confined wholly to small and medium-sized lots, and almost any price can be had for early shipments. There is also a firmer tone for long deliveries. Several thousand tons of basic pig iron were sold during the week at $19 for deliveries late in the fall; also low phosphorus iron at $22.50 to $23 at the furnace. It is impossible to place orders for steel billets for any seasonable deliveries, and the effort made to obtain billets abroad has not turned out as was expected. The domestic price is supposed to be from $33.50 to $34.50.

Activity in manufactured iron and steel continues at an enormous rate, and notwithstanding the enlarged output, the scarcity of certain kinds of material is as great as ever.

Under the circumstances the outlook cannot be anything but satisfactory, and it is likely to continue so indefinitely so far as can be seen at the present time. Quotations are nominally unchanged, but considerably more is necessary to secure anything like reasonable attention.

CURRENT QUOTATIONS:

Foundry, 1	$20 00	21 50	Girder rails	32 00	32 [illegible]
Foundry, 2	18 50	20 50	Angles, 3" & lr'gr		1 [illegible]
Gray Forge	17 50	18 50	Under 3-inch		1 [illegible]
Bessemer billets		33 50	T's 3" and larger		1 [illegible]
Open h'rth bil'ts	35 00		Under 3-inch		1 [illegible]
Steel bars	1 70	1 80	Heavy plates		1 [illegible]
Refined iron bars	1 90		Beams and chanls		1 65
Standard rails	28 00				

New York—Rogers, Brown & Company—Iron market conditions show practically no change. The features of short supply, excess demand.

practical wiping out of stocks in first hands. long forward reach of current business, steady, but restricted importations. slightly improved car supply, etc., continue.

It is inevitable that conditiors like the present should lead to large expansion of plant. We have referred to blast furnace projects that have been taking shape since the beginning of the year. A view of these that may be regarded as now fully settled, warrants the statement that within three months, fifteen new furnaces will be in process of construction, that will add when completed, at least five thousand tons daily to the pig iron product of the country. Seven of these are to be built by well known existing companies, and eight by new companies, capital for which is provided without public financing. All but two of these furnaces will be built in the North, and draw their upplies from Lake Superior ores and Pennsylvania or West Virignia coke. It will require an average of a year and a half to complete the furnaces, which are all of large capacity and most modern design. It is fair to assume, therefore, that the builders do not look to the present conditions, but to the future settled history of the iron trade of the country, for their returns.

Adding to this new capacity the constant improvement of existing plants by addition of blowing and heating power, it is safe to say that we have already production well in sight of at least 21,000,000, tons a year. It is quite probable, therefore, that consumers who can see their way through the next twelve or eighteen months will not have occasion to suffer again from scarcity of raw material. It is quite likely that reports of current prosperity will invite promotion schemes for still further expansion of plant. In that event, the condition of survival of the fittest will the sooner return.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$19 50	21 00	Angles	2 00	2 50
No. 2X fdy Jersey City	17 65	20 00	Tees	2 00	2 50
No. 2 plain Jer C	17 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	21 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	20 00		Com. base, bars per 100 lbs	1 65	1 70
No. 3 fdy N. Y.	19 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	17 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 0
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	11 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

Chicago—Considerabie pig iron for use in the West during the last half of the year will be needed in addition to that already purchased. There is immediate inquiry for this iron, but the melters are not pressing the conclusion of their requests very eagerly, and are evidently in doubt as to whether to close or allow the business to remain open for a while. Prices of all grades of pig are strengthening slowly for both early and future shipments. In view of the scant stocks in the hands of furnacemen, the slightness of trouble in securing enough iron to keep foundries running is rather remarkable. The needy user appears ocassionally and when he does appear he wants material badly, but compared with the number of melters who are obtaining enough iron to keep busy, the inconvenience is slight. For prompt shipment quotations are advanced more decidedly than for future delivery.

In finished products the market is continuing on its recent path of strength and scarcity. Sheets are comparatively easy, but bars, plates, merchant steel and other products are not equal to demand. Structural shapes are so scarce that excessively high premiums are being paid for early shipments from store.

The tone of the old material market is slightly easier. Offerings are larger and large users are said to be fairly well stocked up. But there is as yet no decided decline in quotation.

CURRENT QUOTATIONS:

Bessemer	20 00	21 00	Sheets, 26 store	3 25	3 40
Fdry Nohn 1	9 50	20 00	No. 27	3 35	3 50
Northern 2	19 00	19 50	No. 28	3 45	3 60
Northern 3	18 50	19 00	Angles	1 75	
Southern 1	19 15	19 65	Beams	1 75	
Southern 2	18 65	19 15	Tees	1 80	
Southern 3	18 15	18 65	Zees	•1 75	
Forge	17 65	18 15	Channels	1 75	
Charcoal	21 00	22 00	Steel melt'g scrap	17 00	18 00
Billets, Bessemer	32 00	34 00	No 1 r.r. wrought	20 00	21 00
Bars, iron	1 85	1 95	No. 1 cast, net ton	11 50	15 00
Bars, steel	1 75	1 85	Iron rails	24 00	25 00
Rails, standard	28 0		Car wheels	19 0	20 0
Rails, light	32 00	36 00	Cast borings	8 00	8 50
Plates, boiler	1 90	2 00	Turnings	13 00	14 00
Tank	1 75	1 80			

Cincinnati—Tnere has been a good demand for pig iron, and though the tonnage movement has been materially restricted by scarcity, there has been considerable business. It has, however, been solely in small and medium sized lots for immediate and early delivery, the inquiries from large buyers, with the view of covering their wants for the last half of the year, having thus far failed of results. Furnacemen have not felt warrranted in naming prices for that period, but their contracts, which have been closed for early deliveries, have been at a very essential advance.

Steel billets continue extremely scarce, no transactions being reported, and the price remaining nominaly at $33 to $33.50.

Manufactuerd products have not shown change during the week, but heavy tonnage is being

placed right along, and premiums continue to be paid on all prompt deliveries. Bars are $2 a ton higher for carload lots, and upward with a demand reported. Virtually no structural material of any size or shape is obtainable this side of midsummer. The sheet makers are unable to meet the requirements now being crowded upon them, and some trouble is brewing, probably including an advance in the card quotations. Plates continue to improve in demand and deliveries are not so easy to secure as they were a short time ago. Prices are stronger as quoted, but in many cases premiums are required for quick shipments.

The steel rail market developed no transactions during the week. Standard sections continue to be quoted at $28 at mill.

While the association will give out no quotations the following prices are obtainable in this market:

CURRENT QUOTATIONS:

South. fdy. 1	18 75	$19 25	Standard Sections	29 90	30 90
South fdy. 2	18 25	18 75	Sheet, 26	3 40	
South. fdy. 3	17 75	18 25	Sheets, 27	3 50	
South. fdy. 4	17 00	17 50	Sheets, 28	3 60	
Grey forge	17 00	17 50	Angles, 3 to 6 in	1 70	
Mottled	13 50	15 00	Angles, 1¼ to 2½	1 82	
Shn. 1, soft	18 75	19 25	Beams and Chanls 15 in and under	1 70	
Shn 2, soft	18 25	18 75	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	22 00	22 50	Tees	1 75	
L. Superior, 2	21 00	21 50	Z's	1 70	
L. Sup'r char'l c w	22 0C	23 00	1 wrought scrap	14 0J	15 00
Hang'g r'k ccl, 1	26 00	28 00	Steel m'lting stock gross ton	13 00	14 00
Sohn ccl c w	20 35	20 60	No. 1 cast	12 00	13 25
Jaksn cy. silv'y 1	21 50	22 00	Old iron rails g t'n	18 50	19 50
St'l brs base h'f ex	1 72		Old car wheels	15 25	16 00
Iron bars	1 82		Cast borings	6 50	7 00
Flange plates	1 80		Turnings	7 00	7 75
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

Birmingham.—The smaller Southern iron concerns continue to sell pig iron at an advance of $1.50 to $2 per ton and more over published quotations, it is freely stated. Meanwhile the larger concerns, sold up for the remainder of the year, adhere vigorously to the policy of keeping the market to the $12 per ton basis for No. 2. The larger operators are afraid, if they raise the price of pig iron, the railroads will raise freight rates and that it will be easier to have the rates raised for freight than to have them reduced in case pig iron should come down.

Shipments of all sorts of metal are very heavy and the railroads seem at last to have found plenty of cars. The month of April will have been a record breaker, it is anticipated, in car movements.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 50	13 50	Tank	1 80	
No. 2 fdy, Sohn	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 50	12 00	No. 1 wrought	14 00	
Grey forge, Sohn	11 00	11 50	No. 1 cast	12 00	
Billets	23 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	3 10	3 50
Fire box	2 00				

Coal.

Pittsburg—The backwardness of the movement of coal to the lake ports has held back a general extension of the production of coal in this district, but the improvement in the transportation end of the trade, by the railroads will have the effect shortly of advancing the position of operations. The supply of fuel for local consumption is more liberal than for many months.

Cleveland—The coal supply continues below the requirements of the contract vessels, with some shippers and others not chartering any too many wild vessels. Some of the big shippers are contending over docks, and the season promises lively times in this respect, if the present clip is kept up. Contract boats are being sent to the head of the lakes light, no loads being ready for them. This is occasioned by the ever present shortage of cars.

Cincinnati—The coal elevators have reached a conclusion in their deliberations looking to establishing the rates of coal during the summer months. The rates that will be in force are as follows: On anthracite, May and June $6.50: July, and August, $6.75; September $7.00; lump May, June and July $2.75 downtown, and $3. on the hill; lump, at the elevator, May and June, $2.25; Pocahontas, May to September $3. downtown, and $3.25 on the hill. These prices have not been agreed to by all of the companies, some of them refusing to attend the meetings.

Chicago—The upper lake prices for bituminous coal have been established on the same system employed in anthracite trade, namely, a fixed circular price, with a discount beginning in the spring and decreasing month by month until autumn, when full circular becomes operative. The circular for bituminous coals at all upper lake ports is based on $3.55 for Youghiogheny lump; $3.47 for West Virginia lump; $3.37 for Pittsburg, No. 8; $3.35 for Hocking Valley lump: West; $3.60 Virginia splint; $4.35 for smokeless: and $5 for cannel lump. There are proportionately lower prices for dock run nut and screenings.

For May delivery a discount of 35 cents is made on all sizes except screenings, from which a discount of only 15 cents is made. The Western market has been moderately active. Completion of annual contracts is still impeded by uncertainty respecting freight rates for the year.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4 60 Sonega, $4.60

Coke.

The relative positions of the Connellvsille and Masontown coke fields were reversed as to production last week, the Connellsville region proper making a gain while the Klondike fell back. The gain in shipments was more pronounced than the gain in production especially to Pittsburg and Eastern points. The blast furnace and foundry interests report much better condition in fuel supply and the railroads promise better transporation steadily as new cars and locomotives are being placed in service every day.

A summary of the Connellsville region for the week shows 20,535 ovens in blast and 751 idle.

The following figures show the scope of operations.

Production for the week	224,589 tons,
" last week	224,477 tons.
Increase	112 tons.
Shipments—	
To Pittsburg and river points	3,831 cars.
To points West of Pittsburg	5,625 cars.
To points East of Everson	2,182 cars.
Total	11,638 cars.
Last week	11,438 cars.
Shipments in tons for week	251,217 tons.
" " " last week	248,475 tons.
Increase	2,742 tons.
Masontown Field	
Shipments for week	600 cars.
" last week	660 cars.
Decrease	60 cars.
Shipments in tons	15,600 tons.
" last week	17,160 tons.
Decrease	1,560 tons.

In these days of organization of large manufacturing interests, the ownership of such property is becoming more and more thrown into the shape of stocks and bonds.

Pittsburg is becoming not only the center for the manufacture of iron and steel, but is growing in importance as a place for the sale of iron securities.

Robert C. Hall, member of the Pittsburg Stock Exchange, will be pleased to give any information possible at any time concerning these securities, or make transactions therein.

Telephone Long Distance 3613 Court, or write No. 345 Fourth Avenue, Pittsburg, Pa.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detai p to and including April 28, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	692 993	421,722
Tidewater	226,957	98,093
Southwest	44,054	258,401
Eureka	32,716	949,864
Buckeye, Macksburg oil	6,172	381,434
New York Transit	1,032,922	
Southern	682,644	....
Crescent	176,392	....
Total	2,954,850	2,109,541
Daily averages	109,487	78,491
Buckeye / Indiana Local Division	1,127,107	1,401,101
Daily average	41,744	51,893

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
April 23	$1.85	$1.20	$1.20	$0.88	$0.83	$0.83
April 24	1.35	1.20	1.20	0.88	0.83	0.83
April 25	1.35	1.20	1.20	0.88	0.83	0.83
April 26	1.85	1.20	1.20	0.88	0.83	0.83
April 28	1.85	1.20	1.20	0.88	0.83	0.83
April 29	1.35	1.20	1.20	0.88	0.83	0.83

The Metal Markets.

Tho metal markets.

LONDON—Tin—£129 £122 15s. Sales, 470 tons spot; 1,220 tons futures.

Copper—£53 1s 6d-£52 7s 6d. Sales 1,550 tons spot; 1,900 tons futures.

Lead—£11 16s 3d-£11 12s 6d.

Spelter—£18 2s 6d—£18.

NEW YORK—Tin—$27.62½.

Copper—Lake, 12¼; electrolytic, 12—11.87½ casting, 12—11.75.

Lead—$4.15

Spelter—$4.50-$4.37½.

ST. LOUIS—Lead—$4.00.

Spelter—$4.17½-$4.15.

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	10.75	c
Copper, light bottoms	9.50	c
Heavy Composition	10.75	c
Brass Turnings	7.00	c
Heavy Brass	8.62½	c
Light Brass	7.87½	c
Heavy Lead	3.90	c
Tea Lead	3.70	c
Zinc Scrap	3.12½	c
No. 1 Pewter	19 00	c

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4 75.

Ore Situation at Cleveland.

The controversy between the Great Lakes Towing Company and the firemen has settled down to a bitter war. The outcome is watched with interest as the effects will naturally be wide spread. The success of the firemen would bring about demand from all of the ports on the chain of lakes for the same wages that are paid to the Duluth men concerning whose demands the present controversey is waged.

The strike has had a paralyzing effect upon the freight market. Its blight has been more severe than the delay caused by the lack of railroad equipment, although that is severe enough. The boats are not moving freely at any of the ports, which is delaying those shippers who have the few cargoes ready. On the other hand in the coal, grain, and ore trades there is a supply of boats far in excess of the demand for them. The ore shippers have fairly been swamped with tonnage during the last few days, boats being offered in bunches, but not all of them have been employed, or if they have the charters are made with the understanding that too great nicety is not to be expected in the way of dispatch. The rates hold steady.

New Aluminum Plant.

The Pittsburg Reduction Company, the only company using the electrical process of reduction, will build one of its largest plants near East St. Louis, Ill. Instead of shipping the clay from which the metal is extracted to New Kensington, as they have so far been doing, the officers of the company have decided to erect reduction works in the neighborhood of the supply. The location chosen is three miles out of East St. Louis, easily reached by a branch railroad Here the company has a plot of 20 acres for the new buildings and 10 acres of marsh land to be used as a dumping ground. The buildings will cover six acres and will be similar to those now located at New Kensington.

As soon as the buildings have been completed eight calcining furnaces at New Kensington will be removed to the new works. The addition of the new plant will make considerable change in the methods of the company, and will mean a large increase in capacity. During the last few years the beauxite from which the aluminum is extracted had been shipped from Alabama or Illinois to New Kensington. Here the white, fleecy aluminum was separated from the refuse and shipped to Niagara to be melted in solid bars. It was then sent back to New Kensington and rolled into sheets or drawn into wire so that it could be used for finished products.

In connection with the plant at New Kensington, but under charge of a separate company, are works for the casting and stamping of the sheets into cooking utensils. Hereafter the aluminum clay will be reduced on the spot where it is found.

Crocker-Wheeler Crane Equipments.

The Crocker-Wheeler Company reports a satisfactory increase in the demand for crane motors and equipments. Several new sizes have lately been added to this line, which is now in such shape as to supply machines of from one to 60 h. p. The various types are designed to fulfill the several crane applications which call for trolley, bridge and hoist work. The following recent shipments show the variety of outputs that have been ordered in the past few weeks:

Four motors size, 45, 50 h. p. output; 11 motors, size 22 30 h. p. output; 25 motors, size, 14, 15 h. p. output; four motors, size 6, 10 h. p. output; 11 motors, size 6, 7½ h. p. output; 14 motors, size 2½, h. p. output.

Installing Industrial Railways—The C. W. Hunt Company, through its sales department of Pittsburg under the management of Daniel Ashworth, is meeting with marked success in the sale of industrial railway equipments. An order has been lately received from the Westinghouse Electric & Manufacturing Company, East Pittsburg, for an electric locomotive and a large number of cars for the new industrial railway which it is establishing at its works. The Westinghouse Air Brake Company, Wilmerding, has also placed an order with Mr. Ashworth for a complete industrial railway plant, consisting of an electric locomotives, cars, tracks, etc.

The C. W. Hunt Company has just completed and put into operation one of the most complete coal and ash handling plants in the country at the new Union station power house, this city. Quite a number of parties interested in such a plant have visited the place and inspected its operation and have pronounced it one of the most modern ever constructed. The Hunt works at Staten Island, N. Y., are exceedingly busy in all its departments. Its electric locomotives, operated by storage batteries, are attracting much attention by reason of their simplicity and many are of the belief that the Hunt locomotive is the coming power for industrial railway purposes.

These locomotives and other appliances are fully described and illustrated in a catalog which Mr. Ashworth is distributing to those who may be interested.

Steel Corporation Plans.

The United States Steel Corporation, through its circular April 25, gave to the public the details of the plan for converting $200,000,000 of 7 per cent preferred stock into 60 year 5 per cent bonds and for selling $50,000,000, more of the bonds at par to the stockholders. The method of transfer has generally known for some time but the circular tells just what is to be done with the $50,000,000 cash to be realized from the transaction.

Half the $50,000,000, is to be expended for impovements upon the properties of the corporation and it is estimated that these improvements will result in an annual saving of $10,000,000, besides increasing the output so that the yearly profit will be increased between $10,000,000 and $15,000,000. While these improvements could be made gradually, as the management points out, this course would necessitate extending them over a period of years, and this would correspondingly delay the realization of the profit which can be obtained promptly by the immediate use of the money.

Many of the subsidiary companies, it is pointed but, had improvements under way when the Corporation was formed. These improvements were in such condition that it was ims possible to stop all construction and in order to finish the work, cash payment has been made during the year amounting to $15,000,000.

Within a few months will fall due payments aggregating about $10,000,000 for property purchased almost immediatly after the Corporation was organized. In the preliminary report to stockholders these payments were called purchase money obligations. The management desires to capitalize both the $15,000,000 expended during the year for commitments made prior to the Corporation organization, and the $10,000,000 yet to be paid for the properties, as stated.

To secure the $50,000,000 without issuing preferred stock the Executive Committee believes it is practicable to rearrange the Corporation capitalization, which in round numbers now consists of $300,000,000, of bonds, $500,000,000 of preferred stock and $500,000,000 of common stock, by substituting for $200,000,000, of the preferred stock 200,000,000 of sinking fund 60 year 5 per cent mortgage gold bonds, and by selling $50,000,000 additional bonds of such issue for cash.

As the preferred stock carries 7 per cent dividend, while the bonds would bear but 5 per cent interest, the $50,000,000, desired could thus be added to the corporate resources and the aggregate of the annual charges for interest and dividends instead of being increased $3,500,000 would be decreased $1,500,000 as compared with the present sum total of these two requirements.

The value of the properties, the circular says, fully justifies an increase in the bonded indebtedness especially since the net earnings during the past year amounted to $111,000,000, being four fold the entire interest charge of $27,500,000.

To insure a 4 per cent interest earning by the sinking fund, the corporation reserves the right to call the bonds at 110 at any time after 10 years, and during the first 10 years the bonds may be bought in the open market for the sinking fund.

To offset the exhaustion of ore beds, coal, and deterioration of plants, various sinking funds are being maintained. The further provision of this additional sinking fund to retire the proposed new bonds is in effect equivalent to retiring 40 per cent of preferred stock in 60 years without increasing the aggregate of the present interest and dividend charges. In fact, decreasing them by a net saving of about $500,000 a year.

To further the success of the plan there has been formed a syndicate including some directors which will receive four-fifths of the 4 per cent compensation to be paid to J. P. Morgan & Company as underwriters.

Each preferred stockholder is offered the right to subscribe for the new bonds to the extent of one-half of his holdings. Payments to be made 90 per cent in stock and 10 per cent in cash.

Wire Rod Production—According to compilations made by the American Iron & Steel Association, the production of iron and steel wire rods throughout the United States in 1901 was the largest in its history, aggregating 1,365,-934 gross tons, an increase of 519,643 tons, or over 61 per cent over the production of 1900. Of the 1901 production 1,365,459 tons were steel and 475 tons were iron rods. The following table gives the production by states, with comparison with 1900:

States Gross tons.	1900	1901
Massachusetts, Connecticut, Rhode Island, New York, and New Jersey	134,502	176,101
Pennsylvania	240,533	586,037
Kentucky, Alabama and Ohio	244,731	426,679
Indiana and Ilinois	265,525	381,117
Total	846,291	1,365,934

Rhode Island, which appears among the wire rod producers in 1901, does so for the first time. A considerable quantity of wire rods, especially of the finer grades, is still being imported, the total of such imports in 1901 being 16,804 gross tons, as compared with 21,092 tons in 1900. These imports came chiefly from Sweden, Norway and Great Britain. Exportation of steel wire rods amounted to 8,164 tons in 1901, as compared with 10,652 tons in 1900.

American Foundry and Construction Company.

The American Foundry & Construction Company, of this city, recently incorporated, has effected a permanent organization with the following officers: Jeremiah Miller, president; H. E. Weiskopf, secretary and treasurer; G. E. Klingelhofer, general manager. The company has secured one and one-half acres of land at the intersection of Hazewlood avenue and the Baltimore & Ohio Railroad, Hazelwood, and has begun the building of an 80x160 feet, two story machine shop, and an 85x160 foundry. The entire equipment will consist of the latest improved appliances to carry on general foundry and machine business. A specialty will be made of blast furnace and rolling mill work and high pressure steam piping. Contracts have been let for most of the equipment which will include two 10-ton and one 15 ton electric traveling cranes. The company has opened an office at 530, Frick building.

Absorbed a Plant.

The United Engineering & Foundry Company has absorbed the Apollo Iron & Steel Company' foundry plant at Vandergrift for a sum said to be close to $325,000. The acquisition of the new foundry gives the combination four operating foundries and the largest output of rolls of any concern in the world.

The Vandergrift foundry has been operated exclusively on rolls since it was built several years ago. The foundry department was operated separately from the Apollo Iron & Steel Company although it was owned by the same interests, principally the Vandergrift estate, G. G. McMurtry and Joshua Rhodes. George G. McMurtry was president, S. H. Vandergrift, vice president, M. B. Bache, treasurer and J. I. Buchanan, secretary.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....36c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lot of 100 pounds, $1.10 per lb.; special price on large lots

ARSENIC IN COAL AND COKE.

BY ALFRED C. CHAPMAN.

OWING to the necessity of obtaining malting fuel as free as possible from arsenic the detection and estimation of that element in coal and coke has become in many laboratories a matter of almost everyday procedure. Up to the present time, different methods have been adopted by various chemists, and the somewhat serious discrepancies which have frequently characterized the results are in themselves sufficient evidence that those methods are not altogether beyond criticism. Many analysts have resorted to processes involving the more or less drastic treatment of the fuel with sulphuric acid or nitric acid, or with mixtures of those acids under varying conditions. Others have adopted the method of deflagration with an alkaline oxidizing mixture, while others again have endeavored to obtain the arsenic by distillation with hydrochloric acid and a reducing agent. For some time I adopted what may be described as an acid extraction method, always, however, with a feeling that it was open to considerable objection. When it became recognized that a considerable proportion of the arsenic in fuel remains in the ash when the fuel is burned, I made a number of determinations of this fixed arsenic, and found that in many cases the results were in excess of those which I had got by the acid process in my endeavor to obtain the total arsenic. It was obvious, therefore, that some other method was required, and after many experiments the process described below was devised. There can be little doubt that the arsenic in coal is present as arsenical pyrites, and that little exists in any other form. I thought, therefore, that it might be interesting to ascertain how arsenical pyrites itself behaved when strongly heated in the presence of an excess of oxygen. Two samples of pyrites, "A" and "B," having respectively the following composition, were experimented with:—

Sample.	Arsenic	Iron	Sulphur.
"A"	42.32 per cent	33.66 per cent	17.68 per cent
"B"	44.27 per cent	34.65 per cent	17.34 per cent

Weighed quantities of these were heated to a bright red heat in a porcelain boat placed in a piece of ordinary glass-combustion tubing, the ignition being continued until the weight became constant, and the arsenic left in the residue, apparently as ferric arsenate, was then determined. In the case of "A" this amounted to 8 per cent, and in "B" 6.34 per cent. It will be seen, therefore, that a considerable proportion of the arsenic is incapable, under these conditions of volatilizing.

Then the pyrites was ignited with three times its weight of powdered wood charcoal the amount of arsenic remaining in the residue was increased, which may possibly be due to the fact, that owing to the dilution of the pyrites, the heating would necessarily be more gradual, and so increased opportunity for the oxidation of the arsenide would occur.

Before the method described below was arrived at, attempts were made to effect the complete oxidation of the coal by means of boiling concentrated sulphuric acid as in Kjeldahl's nitrogen process, but so much difficulty was experienced in preventing the extraction of traces of arsenic from the glass that the method was soon given up. It was open, too, to the objection that anthracite coal requires a very considerable time for its oxidation while coke is still more resistant. The method referred to at the commencement of this paper, and which I have now adopted, consists in the gentle ignition of the fuel with a mixture of magnesia and carbonate of soda, and is carried out in the following manner:—

A weighed quantity of finely-ground fuel, depending upon the amount of arsenic it contains, usually from 0.5 gramme to 2 grammes will be found to be sufficient, is intimately mixed with about 2 grammes of pure calcined magnesia and ½ gramme of dry sodium carbonate in a deep platinum, or preferably, a silver crucible. This is then supported in a slanting position, and heated by a flame which is just capable of keeping the bottom of the crucible at a dull-red heat, the contents being stirred

by means of a platinum wire from time to time. At the end of about one hour the oxidation will be complete, and ½ gramme of pure ammonium nitrate is then added. and the crucible ignited somewhat more strongly for about five minutes. This latter treatment is intended to oxidize any traces of sulphides which might have been formed, and which would, of course, tend subsequently to form insoluble arsenious sulphide and so to remove it from the sphere of action in the Marsh apparatus. I have no actual proof that this part of the process is necessary, but I think it safer to adopt it. In this way, if care be taken not to heat the contents of the crucible too strongly, a powdery mass will remain, which can be readily removed. This is washed out into a beaker with dilute sulphuric acid and the solution is then concentrated so as to decompose any nitrate that might have remained after the above ignition. This solution is then submitted to the modified Marsh-Berzelius method, and the mirror or mirrors so obtained are compared with standards. Should the fuel under examination be found to contain an unusually large amount of arsenic, it is obvious that the sulphuric acid solution may be made up to definite volume and an aliquot portion used in the Marsh apparatus.

The following results will show that this method is accurate with very much larger amounts of arsenic than would ever occur in coal and coke.

In these experiments, weighed quantities of arsenical pyrites of known composition were mixed with coal in which the amount of arsenic present was entirely negligible in comparison with that which was added, and the mixture treated as described above, save that the arsenic was determined gravimetrically as sulphide:—

Taken	Found.	Taken	Found
Arsenic 0.0050 gramme	0.0042 gramme	Arsenic 0.0096 gramme	0.0085 gramme
Arsenic 0.0092 gramme	0.0096 gramme	Arsenic 0.0063 gramme	0.0055 gramme

In the following table numbers are given showing the amounts of arsenic present in six samples of coal, as well as in the coke made on a large scale from these samples, and in the ash; while the percentages of ash, of iron and of calcium, are also given. It may be mentioned that these samples were gas coals, and were selected on account of the appreciable amount of arsenic which they contain:—

Sample of Coal.	Arsenic in Coal. Grs. per lb.	Arsenic in Coke. Grs. per lb.	Ash of Coal. per cent.	Arsenic in Ash. Grs. per lb. calculated on the coal
1	1.4	1.7	6.4	0.6
2	0.5	0.7	16.2	0.3
3	0.7	1.0	6.7	0.3
4	0.7	0.6	2.1	0.6
5	0.8	1.1	12.5	0.7
6	0.9	0.6	12.2	0.3

Sample of Coal.	Iron in Ash, per cent, calculated on Coal.	Calcium in ash per cent, calculated on Coal.	Alkalinity of Ash.
1	2.27	Trace	Distinct
2	1.71	Trace	Slight
3	2.62	None	Neutral
4	0.73	None	Neutral
5	1.96	None	Neutral
6	3.50	1.8	Very distinct.

It will be seen that there is no definite relationship between the amount of arsenic present in the coal and that left in the ash on ignition, the proportion being apparently dependent upon the composition of the ash, as well as upon the manner in which the ignition has been performed. There can, I think, be little doubt, as I have stated above, that the arsenic in coal exists almost entirely as a constituent of the pyrites present, and that little exists in any other form. The two following tables are of interest in this connection. From one of the two samples of coal referred to in the above table, the pyritic portions were picked out. An estimation of the arsenic present in this sample showed no less than 1.9 grains per pound, while only 0.2 grains per pound was present in the non-pyritic portion. In the second experiment two samples of New Zealand coal, taken from different parts of the same seam, and giving on analysis the following results were examined:

	No. 1	No. 2
Ash	4.55 per cent	1.60 per cent.
Volatile sulphur	2.46 per cent	3.22 per cent
Total arsenic	0.2 grain per lb.	0.5 grain per lb.
Arsenc in ash	0.1 grain per lb.	0.18 grain per lb.

Although No. 2 continued much less ash than No. 1, yet in the former there was a distinct quantity of iron, while the latter was practically free from that element, and it will be seen that the amount of arsenic in No. 2 was distinctly greater than in No. 1. As examples of the application of this method to higher class fuels than those referred to above the following numbers obtained with Welsh anthracites of high quality may be recorded:—

	No. 1.	No. 2
Total arsenic	0.03 grain per pound	0.035 grain per pound.
Arsenic in Ash	0.01 grain per pound	0.020 grain per pound.

That the method described in this paper is capable of yielding approximately accurate results in the analysis of fuel admits of no doubt, and it has the merit of being easily performed, and of involving the use of materials which can without difficulty be obtained perfectly free from arsenic. It is obvious that it might with slight modification be employed in the analysis of other organic materials than coal and coke.

SHEET FURNACE BOTTOM.

As is well known the bottom for sheet heating furnaces most largely employed consists of a mass of broken pieces of cinder, brick, or like noncombustible material which is spread over the furnace floor and provides a bottom having interstitial passages and presenting a broken and uneven surface. This bottom has the advantages that while it was noncombustible it would itself store the heat of the furnace and prevent the heat from passing through the interstitial passages and provide for the more even heating of the packs; that it overcame "patching" in the pack from the sulphur contained in the coke previously used for such bottoms; that the dust could settle down within the mass, and the bottom could be removed from time to time for cleaning. The main difficulties with this broken cinder or brick bottom have been that small particles of the cinder or brick were liable to break off and enter between the sheets of the pack and spoil the rolls or spoil the sheets in their passage through the rolls, and that if the brick is soft, particles would adhere to and form streaks on the sheet as rolled. It was also difficult to clean the angular broken pieces of cinder or brick, as the dust and dirt would adhere.

P. F. Smith, of this city, has devised and patented an improvement which consists in making the bottom of a loose mass of hardburned clay balls or other globular bodies; this bottom while providing support for the packs upon the higher portions of the balls, permitting the passage of the heated gases through the interstices formed between them and the contact with the packs and the supporting balls having no angular portions to break off and enter between the sheets or adhere to the sheets and be carried into the roll, while they can be more easily removed and cleaned or separated from the dust carried into the heating chamber from the fire-chamber, a cleaner and better bottom being provided.

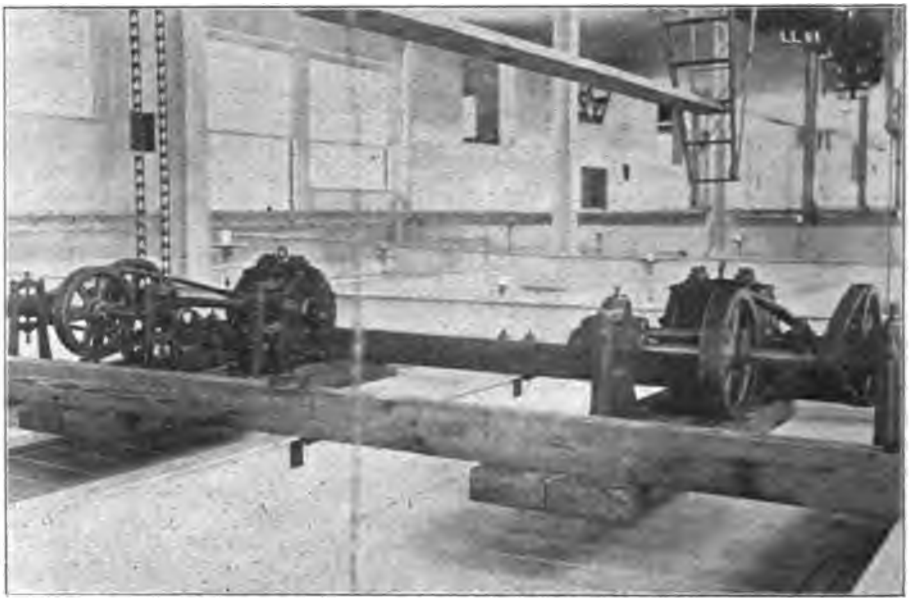
Mill Saws in British Columbia—Under date of April 2. Consul L. E. Dudley reports from Vancouver: There seems to be an opening for a manufactory of mill saws in this city. The demand would be large, if the saws manufactured were of approved quality. It is said that Canadian saws are not satisfactory, and that the United States product is imported, although some of them cost $24 each and there is a duty of $8. At this price, there would be a large profit for any manufacturer who would take the trouble to invest here. I shall be glad to procure further information for any person who may desire to consider the subject.

ELECTRICALLY OPERATED MACHINE TOOLS.

BY FRANK C. PERKINS.

DURING the past ten years the introduction of electric drive for machine tools has been very rapid in the European countries. Very extensive work has been done in this regard on the continent and in England by leading manufacturers of electrical machinery almost all of whom have equipped their plants with central power stations. The larger machine shops are recognizing the advantages to be secured by using electric tools, and they are rapidly following the lead of the electrical factories which have proved the successful operation of this method of power transmission, and have shown its advantages over shafting, pulleys and belts.

The introduction of electrically driven machine tools in America as well as in Europe was first adopted in the shops of leading manufacturers of electrical machinery. The most complete central power station and electrical power distribution systems for workshop practice may be found in the works of the Westinghouse Electric & Manufacturing Company. The General Electric Company, The Bullock Elec-



Sealing Machines, Natural Food Company's Plant, Niagara Falls, operated by Link-Belt Engineering Company's Silent Chain Gear.

tric Manufacturing Company, and other prominent constructing engineering firms, as the Northern Electric Company.

Not only for the present but also for probable future needs, the most economical methods should be carefully considered by the managers in large establishments. Few factories and mills at present stand as originally constructed; nearly all have been enlarged and modified. In consequence of this, small engines and boilers are in existence throughout the various buildings of factories which make no use of electric power, or steam is led to the steam engines through great distances, causing great loss from the condensation of steam. According to the modern plan all smal and inefficient engines are discarded and a central electric plant for the generation of power at greatest efficiency is substituted.

The very great economy of large units of power is thoroughly recognized, but the saving in labor which may be obtained by the use of a central power station is a consideration which is of commercial importance although frequently not regarded.

In localities where separate power units are spread over a wide area in a manufacturing plant, several times the labor is necessary to operate a plant of equal capacity. Where many engines are used to generate power more engineers are needed; and when the boilers are not under the same roof with the engines, they need an increased number of firemen, besides handling the coal and ashes causes greater expenses.

No feature in the working of machinery attracts more attention than that of driving by electricity. Operators in factories and machine shops who were at first cautious and skeptical finally obtained sufficient courage to give the electric system a trial. Such men now perceive that the electrical method is unequalled in convenience, flexibility and economy. The man who has not tried it immediately asks the question why he should adopt the system of electric drive. It may be answered that it is a less costly power; it causes the product to cost less; it enables the output to be increased, and consequently the profit is increased. Several other practical and important advantages are that there is greater convenience in arranging the machines and the materials, greater steadiness of power is obtained; better control and greater range of speed may be secured; the area of the floor may be more economically disposed and greater cleanliness can readily be obtained. The danger to life and limb is much reduced by the electric driving of this class of machinery. The fire risk is reduced as well as the cost of insurance.

Much improvement in sanitation and light may easily be effected where electric drive is adopted. In consequence of the absence of shafting, hangers, levers, gears, belts and pulleys, and because of the fewness of parts in the electric motors, a considerable reduction in the cost of repairs and maintenance is secured. The cost of building is less when either reconstructed or planned for an electric drive.

Losses in the transmission of power by shafting vary greatly, depending on the character of the work, the arrangement of the machines the relative directions of shafting, and their lubrication, alignment and adjustment. The instabilty of supports usually placed under floors and subjected to variable weights causes increased friction and loss.

American Tool Works Company's 42-inch Motor-Driven Triple Geared Lathe.

The superiority in economy of power secured by the use of electric motors is due to abolition of the enormous losses which are always found in any system of shafting and belting.

The floor area needed for the installation of a required number of machines or tools which are meant to be driven by direct-connected electric motors is only about two-thirds of that which would be needed to successfully work them by line shaft transmission.

In the choice of a power system the final decision, the grounds of final decision, are not always expense of operation and first cost.

The great superiority of the electric system consists in its flexibilty. This is of very great importance because by its means provision can readily be made for enlargement to any desired extent, and by the discarding of devices such as bevel gears and cross belts, superior economy can be obtained.

By using electricity the designing engineer has ample scope in arranging the buildings in large plants for he is not compelled to encounter any difficuties in power transmission. The situations of buildings can be determined by the considerations of storage capacity, light, accessiblity, fire risk, and rapidity of handling the products; besides, the machinery can be distributed over a conveniently large space. The increase of capacity in an electrically operated plant involves no pulling out and replacement of a long line of shafting, which would be necessary in case of transmission by mechanical methods. An additional motor is merely required.

In direct connected electrical equipments constructed according to modern methods the losses should not exceed twenty per cent. In many cases it is quite

possible to keep the losses so low that eighty-five per cent of the total power which is generated will be delivered to the machines which are driven. This would admit the use of a more compact and smaller power plant.

Loss of power in line shafting, belts and pulleys is constant during the whole time during which the engine is at work whether only part or the whole of the machines are at work. Also in driving by electricity the generation and consumption of power immediately cease when any tool or machine is stopped. In consequence the power generated at any time is only that necessary to do useful work at machines which are actually at work.

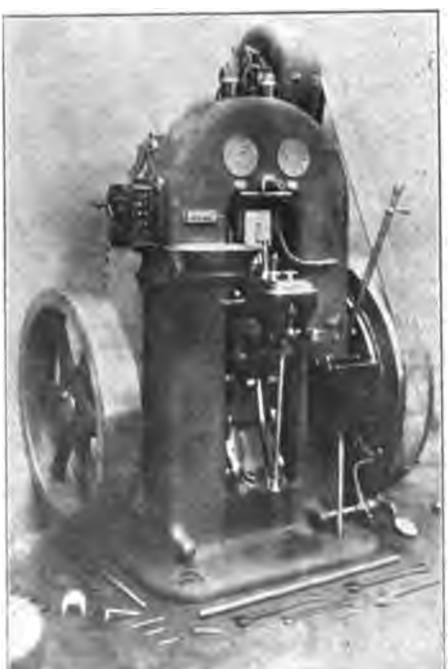
In applying electric power to machinery two systems are in general use, first, a motor is directly connected to each individual machine which is required to be driven, and second a motor is arranged so that it may drive a group of machines by counter shafting. The first is the ideal method, yet in some cases, especially where steam is replaced by electricity, the second method may have the preference. The latest type of silent chain drive is used on countershaft.

Another gain is yielded by the direct current electric motor arising from the increase in daily output of each driven machine, in consequence a material increase in the output per man throughout the whole force is secured. The amount of manufactured product per dollar of wages is greatly increased.

In driving machinery by electricity one important advantage consists in the ease with which any section of the mechanical plant in the works can be worked independently of any other. When working overtime or from any other cause one department can work without any waste of energy while the rest of the plant is idle.

The perfect control of speed is another valuable feature of the electric drive. The speed can be made quite uniform, and no posisibilty of accidental variation can occur. Each machine can be either slowly or rapidly driven in relation to the kind and quantity of the work which is re uired to be performed.

A special form of speed control was designed by the Northern Company. This is operated by buttons which are placed within reach of the machinist. By means of the buttons he can start stop or reverse and run the machine at any required speed which is best suited to the work which is in hand. A range of thirty speeds can be obtained and with increase of power while the speed is lowered for marking even the heaviest cuts, changes in speed being made while the tool is in motion. It can easily be seen that this method is superior to the common method of using shifting belts and gearing which cause either stoppage of the work or a jerk to the shafts, belting and tool, besides the workman is in danger of injury. A great improvement in the sanitary conditions of a factory is caused by the introduction of direct connected electric motors. The constant danger to limb and life is eliminated by discarding shafts an belts. Overhead a free and unobstructed view is found in place of many moving belts which shut out light and keep the dust in constant motion.



Fermacute Coining Press Operated by Crocker-Wheeler Multi-polar Motor.

Abundance of fresh air and light are stimulants which immediately act to the advantage of the em-

ployer by making each employe more efficient in the production of either more or better work. This point is very important in determining whether or not a plant should be electrically equipped. Plants now operated electrically show in actual returns that the output has been increased from ten to thirty per cent. All managers should consider these results.

It is almost always best in a new installation to drive all machines using 5 H. P. and more by separate motors. This necessitates greater expense than one large motor for several machines, but with separate motors the speed can be changed to suit the work.

The various speed required by most machines under various conditions of operation may be secured by direct connected motors and which controlthese.

Great expense is saved when electric power is used by the elimination of most of the belting and shafting. Little difficulty is experienced in keeping machinery in operation and the men productively employed where no shafting requires lubrication. and no belts and loose pulleys cause annoyance.

An Oxydizing Method.

CLARENCE S. LOMAX, of Everett, Mass., has devised a method of making oxids of tin and lead, by simultaneously subjecting the metal to the action of an electric current of sufficient quantity to heat the metal to the proper temperature and to the action of an oxidizing reagent, such as air, oxidizing the metal while heated. The process is carried on continuously, the metal being heated by the continuous passage of the electric current and the oxidizing reagent continuously applied to the metal so heated.

A suitable receptacle for the metal is employed, made of electrically non-conductive refractory material provided with circuit-terminals at its ends, by means of which the current may be forced through the metal and to heat it to a temperature suitable to secure rapid oxidation of the metal. The receptacle is constucted so that large contract surfaces may be provided for contract with the terminals of the electric circuit that the terminals may be kept cool and uninjured by the action of the current or by the heat generated by the current in passing through, with a consequent adulteration of the tin or lead. The receptacle has enlarged ends, which receive large terminal plates of copper attached to the terminals of the circuit, the cross-section of the receptacle gradually tapering to its center, so the metal exposed to the action of the oxidizing reagent shall be the smallest and uniform in cross-sectional area, and heated to the highest temperature This form of receptacle is employed because it enables the localization of the heating of th metal at the place where the oxidizing reagent is applied. The cross-sectional are of the metal at the middle of the receptacle can be varied by increasing or diminishing the quantity of metal in the receptacle, to vary the resistance, and regulate the heat generated by a given current and the temperature of the portion of the metal subjected to the action of the oxidizing reagent. In this manner the product can be varied. The size of the circuit-terminals are proportioned to the amount of current used so that the terminals will not be unduly heated by the passage of the current at the point where they come in contact with the liquid metal in the receptacle. In order to maintain the level of the molten tin or lead at a constant height, a bar of tin or lead is gradually introduced into one end of the receptacle. The surface of the molten metal in the receptacle is exposed to the action of the oxidizing reagent, which by combinng with the metal, forms its oxids and is carried off in a fine powder. The chemical action is combustion, the heated metal burning in the atmosphere of the oxidizing reagent. Atmospheric air is used as the oxidizing reagent, although any other suitable reagent may be employed. The oxidizing reagent is applied on y to the central or hottest portion of the metal, which is maintained at a substantially uniform temperature, which would not be the case if the whole surface were exposed. For this purpose there is employed an oxidizing chamber of electircally-non-conductive refractory material extended over the central portion of the receptacle, being the portion which is smallest and uniform in cross-sectional area. This construction, in which the metal in the oxidizing chambers is uniform in cross-section, secures uniformity of temperature of the metal exposed to the oxidizing reagent.

COMPRESSED AIR IN MINING.

T. W. BARBER, M.I.C. E. In The Analyst.

COMPRESSED air, as employed in mining, is one of the very few sources of industrial power to which scarcely any exception can be taken. Its advantages—putting aside for a moment questions of comparative cost—are so very obvious that it seems almost loss of time to refer to them, yet it is still in its infancy. It has been in various half hearted ways partially adopted as a mining motive power for, at least, fifty years past. The slow development of its usefulness is explainable on several grounds. Like every other motive power, it requires time to work out the best results. It is said to be expensive; this we shall deal with presently. A good many mistakes have been made in installing it which have operated against it, and, lastly the installers are not wholly free from blame. Mining engineers as a body are practical men and not much given to studying theory. Some wholly despise it, others lack the necessary application, and this is scarcly matter for surprise, for a mine engineer's work is eminently that of a practical man born and bred to it and who has to rely mainly on experience, for, with the general working of a mine theory has very little to do and we can hardly blame the engineer for taking little account of it.

But mining, like other industrial enterprises, is fast becoming dependent upon advanced knowledge and ideas, and the rising generation of mining engineers will find it greatly to their advantage, in fact, absolutely necessary, to study theory and science to keep somewhere near the front, for methods and appliances are fast coming into use which require something more than mere experience, which are, in fact, ahead of experience and therefore demand insight and adpatability of a high order. In this connection we may mention, besides compressed air, electricity and oil gas motors and the employment of machinery in haulage, pumping and cutting, ventilating, holing and driving.

We propose to deal here with one only of these modern improvements, compressed air and its applications and advantages.

Its special advantages may be worth repeating here, though every engineer ought to be familiar with them.

1. It can be taken by pipes to any point and used there expansively, just the same as steam and in the same engines.

2. The pipes and the air are cool and the air loses nothing by transmission, except by leakage and slight drop of pressure from friction in transit.

3. The exhaust is cold, invisible and wholesome, being free air at low temperature, which may be much below freezing point; a welcome help to ventilation.

4. The engines, being cool, are easy to lubricate and to handle.

5. The air does not corrode the pipes internally.

6. None of the compressing plant need be in the pit, in fact, it is almost always at bank.

7. The cost of it can be kept down easily to that of steam as a motive power if properly installed.

For a moment let us see how this compares with steam, electric, or hydraulic power.

Steam requires boilers, usually below ground. These introduce heat where it is already too hot, the steam pipes and motors are hot, their exhaust is a cloud of hot steam, slow in dispersing and condensing, in fact, impossible to use in detail in the headings and roads for haulage and pumping. Steam engines are, therefore, only usable near the upcast shaft where the heat and exhaust can be got rid of.

Electricity is in many respects a promising rival to compressed air, but in unfiery mines. It has several very serious disadvantages. These are—apart from its cost, which is high—sparking of dynamo motors, danger of short circuiting from accidental causes very common in mines, high speed of motors necessitating great reduction by

gearing The motors are too easily injured by unskilled labor and too easily overloaded. There is at present no sign of overcoming these faults, the first two of which are practically prohibitive so far as coal-mines are concerned.

Hydraulic power is non-elastic and quite unsuited to general driving of machinery even above ground. It is very wasteful in use, not having the expansive economy of steam or air, and miners do not like any influx of water into a pit, for, though it is cheaply pumped to bank by the mine pumping engine, yet the danger from water is such an ever present one that nothing would induce men to use it as a general source of power.

Oil engines are being proposed for mining purposes and may have some useful, if limited, applications; but petroleum is a dangerous fluid in a mine, and the flame from igniters and vaporizes will entirely prevent their use in coal-pits.

There is, therefore, no effective rival to compressed a'r for general motor purposes in a pit.

Air is cheap enough as a motor fluid and miners are always ready for any quantity of it, but to use it economically it must be compressed to about the same pressure as steam is ordinarily used. Sixty to 80 pounds per square inch are ordinary pressures which can be dealt with by the ordinary commercial engines without any special attachment or design. Steam, however, is now used at much higher pressures, 100 to 180 pounds, or more, being common. But such pressures require extra strength in every part and greatly increase loss by leakage and condensation.

In the case of air, the cost of compression and the loss of steam by heating of the air by compression increase very rapidly with the pressure, so that these higher pressures are not at present economical. They require extra strength in the pipes and better joints also, better in fact than any now in use, so that until improvements can be effected in the compressor by which the higher pressures can be economically produced and a good pipe joint devised, to prevent leakage, it is not advisable to incease the working pressure much above 60 pounds.

A compressed air plant consist of boilers, air compressing engines, receiver or air vessel, air mains, branch mains, pipes, valves and air engines.

The character and arrangements of the plant will depend much upon the kind of mine and the work to be done below. In many mines there is no rock work, but much hauling, and in many cases driving power is required for coal cutting machines, fans, etc.

In the interests of humanity hauling ought to be done entirely to save the pony and boy, who are both quite out of their natural element in a pit. The boy ought to be at school or about-door work, and the pony working on the road.

In designing a compressed air plant the proper course to pursue is first to set out a list of all the motors required, their indicated horse-power, the number of hours each is expected to be at work whether continuously or at intervals. From this list the maximum h. p. demanded at any one time can be deduced.

In estimating the maximum h. p. the character of the motors must be considered. Some engineers think that any kind of a rough made, strong engine is good enough in a pit. But this is a serious error. A pit air motor ought to work with the highest possible economy. This is obtainable without any fancy expansion gearing or extensive and complicated valve gear, by using a cut-off slide valve. No engineer should be satisfied with an engine that will not work up to a six or ten-fold expansion. The saving in a good engine from his cause alone may amount to from 10 to 40 per cent.

A high expansion, however, unless the air is heated, produces a very cold exhaust, and unless the air is dry, the exhaust passage may get blocked with ice. This can be avoided by making these passages large, short and direct.

Coal is, of course, cheap, at a colliery, and it might be supposed colliery managers would be careless of such minor savings; but coal is coal, and has to be paid for even in a colliery; dividends have to be looked to also. Power is always a dead horse to the mine-owner, and its economical use makes all the difference and bulks very largely on the wrong side of the yearly balance sheet.

But, having estimated the net maximum h. p. required in the pit, a percentage must be added for leakages which depends on the quality of the pipe joints, as to which any economy in fitting up is a very questionable gain. For a leak leaks twenty-four hours per day and carries off a proportionately large amount of air.

Air mains are frequently of great length, from 1 to 3 miles are common lengths. There must necessarily be some loss by leakage and friction in the mains in such long lengths, and it follows that great care is requisite in laying them. Every pipe should be tested. Settlement of ground is a fruitful cause of broken joints or pipes. A good joint should be flexible and not easily broken by expansion or contraction, due either to temperature or settlement.

If these points are satisfactorily dealt with the loss by leakage should not exceed 1 per cent per mile and the loss of pressure by friction 1½ per cent per mile. Such results have been frequently attained, and the engineer should be satisfied with no less.

The diameter of the mains and distributing pipes is important and depends on two factors, the quantity of air passing and the distance from the compressor.

The receiver is in reality part of the air main and in most cases may be dispensed with, the main itself being of ample capacity.

Where the compressing engines are of the wet type a good deal of water is carried over with the air into the mains and should be trapped out at a point not far from the engines. With the dry compressor there is also some amount of condensation which should be drained from the main, as dry air is of avdantage in the motors, especially if the air is not reheated. Moist air sometimes produces a good deal of ice at the exhaust.

The diameters of the mains depend upon the maximum quantity of air to be delivered, taking into consideration also the reduction in volume it sustains by cooling after passing the delivery valves. This varies between the isothermal and adiabatic lines of the air diagram and can be readily ascertained by computing the area of the diagram outside the isothermal line as compared with the area of the whole diagram.

It may be assumed that the air will have cooled to atmospheric temperature in about fifteen minutes, more or less, according to its delivery temperature, therefore the point along the main at which it may be reduced to its minimum diameter can easily be found.

Expansion joints should be avoided so far as possible; their place can be taken by bends, or better still, by a flexible form of packing rings or jointing.

The velocity of the air in the mains and branches should not exceed 40 feet per second.

Sluice valves are the best to use for all purposes on air mains. The compressor is the most important item of the installation. There are wet and dry compressors. The former uses an internal jet of water to cool the cylinder in conjunction with a water jacket, and the latter a water jacket only.

Where a jet is used it should be forced in by a pump during the latter part of the compression stroke, not during the suction stroke, or it will be quite ineffective. Its value in cooling is doubtful, while its destructive action in the cylinder and piston admits of no doubt whatever. By all means use a dry compressor and take the inlet air direct from outside the engine house, that is as cold as possible. This can be done by using a wood or sheet iron air trunk to the inlet valves.

It must be remembered that every degree gained in low temperature at the inlet means several degrees gained at the delivery and that the engine-room air is usually about 20 degrees higher than outside.

Another important point is provision for utilizing the air in the clearances. The most simple and advantageous method of doing this is by the bye-pass method; ports of grooves are formed in the cylinder at each end a little longer than the thickness of the piston, so that at the end of the stroke these ports pass the air compressed in the clearances to the other side of the piston, where it adds to the initial pressure of the next compression stroke.

The inlet valve should have a positive movement, so as not to require suction to

open it or pressure to close it, as both these cause loss of effective stroke and reduce the capacity of the cylinder.

A positive movement for the delivery valves is not so easy to design, as these valves should open at the moment the pressure in the cylinder reaches that in the mains, whatever it may be. This may beat any point in the stroke, as that it is customary to use spring-loaded valves, lightly sprung and of special design. If too heavy, the diagram will show delivery line at top to be several pounds above the receiver or main pressure. This excess pressure is not all loss because the air expands at the pressure in the mains, but it increases the temperature which it is important to keep down.

Lubrication and its effectiveness depend upon the temperature, which in badly-designed engines often reaches 300 degrees to 350 degrees, at which point oil scorches and produces dry burnt surfaces and corrosion. Gas engine oil should be used. But if proper attention has been given to the foregoing points the temperature at 60 pounds should not exceed 180 degrees.

Good pistons, well fitted to the cylinder, are of more importance than in a steam cylinder; the absence of steam and its moisture causes dryer surfaces, and much leakage may occur which is difficult to locate in the diagram, as it merely causes the compression line to approach the isothermal, giving a false impression of high efficiency.

But the chief loss in every compressor is that due to heating during compression.

The air, after passing the delivery valves, cools to atmospheric temperature and loses in bulk proportionately, the loss varying, according to the pressure and other points previously alluded to, from 25 to 60 per cent and even more.

It is in this direction that the future improvement for air compressors must be aimed.

The latest designs are of the compound or stage compression type in which the compound principle of the steam engine is reversed, the air is compressed in two or more stages, passing through cooling coils to chambers between the stages. In this way the temperature can be kept down, but the increase of economy is not in proportion; the mechanical efficiency of the engine is reduced, piston and other leakages and losses are duplicated, and thus the chief actual gain is in the lower temperature and better lubrication.

Stage compression diagrams do not show these losses and to this extent are misleading. The gain by stage compression is chiefly in working at a lower temperature than in the single compressor.

It is evident that the stage compressor does not cool the air while under compression in the cylinder, but in external coolers after it has passed the delivery valves whereas the cooling ought to be done in the cylinder during compression.

A new type of compressor which is a fine installation has lately been started at the Murton colliery of the South Hetton Coal Company, England. In this compressor the air is cooled before delivery and very high results have been obtained. With air cooling alone, that is, without water-jacket or spray, the air is delivered at 60 pounds at temperature of 160 degrees, and with water sprayed over the tubes the temperature can be reduced to 110 degrees.

With an engine of this type stage-compression is not required, except for pressures of 100 pounds and over.

We have shown that the efficiency of a compressed air plant depends upon a number of small economies and attention to details, which, in fact, make all the difference between an efficient and a wasteful result.

There is another source of economy which has not yet made much progress, but presents a very promising future, that is, reheating the air before losing it in the motors. At first sight one would say that what is thus gained must be lost in cost of coal or other heating medium, but this is by no means the case.

In practice a very small quantity of coal will heat the air in a tubular heater to 250 degrees or 300 degrees, it is not desirable to heat to beyond 300 degrees, and expand the air to more than double the original quantity and thus similarly augment the useful effect in the motors, besides which the exhaust is discharged at

temperature above the atmosphere, and freezing thus avoided. Actual tests of the heating in this way have shown that the efficiency of the entire plant can be brought up to 100 per cent, that is to say, as much work can be given out at the motors as is supplied to the compressor in steam energy.

Without reheating a plant should show an efficiency of at least 50 to 55 per cent.

There are several ways of reheating which are more or less applicable to all cases. A furnace and coil or surface heater is the simplest, but is inapplicable in fiery mines. Where steam boilers exist underground steam pipes can be employed to reheat the air, the temperature obtained being of course not more than about 180 degrees. A furnace or oil burner has been used inside the air main, the products of combustion passing with the air to the motors. Some simple adaptation of this plan as an appliance attachable to any motor seems to be the best form capable of universal application.

This subject is well worth the attention of engineers. To be able to fire a range of boilers with dust or coke gases, producing steam on the most economical scale, and then to be able to obtain the full mechanical energy of this steam in air motors underground a mile or two away from the boilers, without loss, is a most attractive outlook for the mine engineer and owner, and we do not see how it can be improved upon or rivalled by any other form of power transmission.

Reheating enables the motors to run with a much higher grade of expansion than with cold air. With the latter we get in the motor a reversal of the effects of heating described as going on in the compressing cylinder, that is to say we get adiabatic cooling instead of isothermal, the effect being to reduce the pressure and volume of the air more rapidly than is due to its expansion only. Keeping the motor cylinder hot will remedy this and induce isothermal expansion.

The next improvement required in air motors is, therefore, means of heating the air before entering the cylinder, and this should be done in such way as can safely be used in fiery mines.

New Sand Mold Method.

A method of preparing sand molds for steel castings has been patented by Herbert B. Atha, East Orange, N. J., whose object is to provide a mold that will effectually resist the high temperatures of the molten steel and prevent the solid matter of the wash or covering applied to the sand from melting, and injuring both the mold and the casting.

There is applied to the surface of the molded sand a composition consisting of a fine carbonate of magnesium, a highly volatile or inflammable liquid, such as alcohol, gasoline, benzine, naptha, or other liquid having higher volatility than water and rosin. In usual practice the mold is first shaped, employing green or damp sand, common in making molds for steel castings. The sand is suitably packed about the pattern and the latter is withdrawn from the sand after the customary manner. The surface of the green sand mold is then washed with the following composition.

In preparing the wash there is first dissolved in twelve parts of naptha five parts, by bulk, of rosin, and to one part of this solution is added two parts of clear naptha and three parts of a carbonate of magnesium. The rosin serves to hold the carbonate of magnesium in suspension in the liquid, so that the painting may be more uniform and effective. The composition or wash having been applied at the surface of the sand mold, the carbonate of magnesium enters into the interestices between the particles of sand, filling the spaces to greater or less extent, close to and at the surface of the mold, while the liquid of the composition enters more deeply into the sand mold. Fire is then applied to the surface, so that the inflammable carbonaccous fluid is quickly consumed, while the carbonate of magnesium remains, forming with the sand a smooth crust, giving firmness at the surface of the mold. The smoothness of surface is of course conducive to smoothness in the finished casting

The fluid of the composition may be allowed to evaporate without ignition to secure the desired smooth crust. When the liquid steel is finally poured into the prepared mold, the heat of the steel serves to drive off the carbonic acid gas from the carbonate, converting the residual coating into an oxide of magnesium, which is infusible at the high temperature of the molten steel. The gas passses off through the sand or passages provided.

Superheated Steam Trials.

THE results of a series of trials recently conducted by Professor Ewing on a high-speed engine supplied with highly superheated steam have just been issued by Messrs. Easton & Company, limited, of Broad Sanctuary Chambers, Westminister, London. The trials were conducted at their Erith works, and the engine in question works with triple expansion, and is of the vertical inverted double action type, with enclosed crank shaft and forced lubrication. It runs at 400 revolutions per minute, and is coupled direct to a dynamo on the same bed plate, which supplies continuous current at about 220 volts. There are three cranks set at 120 degrees apart, with two cylinders in tandem over each crank. The steam expands first in one of the upper cylinders; then is divided between the other two upper cylinders; and finally passes through an intermediate receiver to the three lower cylinders, which act jointly in the third stage of the expansion. In the high pressure cylinder, and each of the two intermediate cylinders the diameter is 12 inches; in the three low pressure cylinders it is 16 inches: the stroke is 8 inches. The intermediate receiver is furnished with Schmidt's patent re-heating arrangement, whereby a portion of the superheat is taken from the steam before it enters the engine, and is applied to dry or superheat the steam which comes from the intermediate cylinders.

The distribution of steam is by piston valves in three lines, corresponding to the three lines of cylinders, with a supplementary expansion valve to control the cut-off in the high pressure cylinder. This valve, which is also of the piston type, is automatically regulated by a powerful shaft governor operating on its eccentric. The steam is superheated by a Schmidt superheater in the boiler flue.

The following table gives the results of the trials:—

Trial		A	B.	C.	D.	E.
Eectrical output, in kilowatts		140.2	104.0	67.3	41.2	10.0
No. of lbs of steam condensed, per hour		2,507	1,940	1,367	1,004	663
No. of los. of steam per kilowatt-hour		18.3	18.5	20.3	24.4	—
Pressure at stop valve, lbs. per sq. in.		129	130	131	126	82
Temperature at stop valve	degrees C.	376	371	368	352	295
	degrees F.	709	700	694	666	563
Temperature of high pressure steam after receiver	degrees C.	316	305	299	293	255
	degress F.	01	581	568	559	491
Temperature at intermediate cylinder exhaust	degrees C.	141	128	121	118	118
	degrees F.	286	263	250	245	245
Mean temperature at low pressure cylinder inlets	degrees C.	203	193	184	174	159
	degrees F.	397	380	363	345	318
Vacuum, inches		23.15	23.5	23.8	23.8	22.7
Barometer		29.6	29.6	29.6	29.6	29.6
Indicated horsepower		226				
Electrical horse power		188				
Ratio of electrical to indicated horse power		0.83				
Lbs. of steam per indicated horsepower-hour		11.4				

The quantity of steam used per electrical unit, generated at various grades of output, is shown in the following table:—

Kilowatts.	lbs of steam used per electrical unit.
140	18.3
120	18.5
100	18.7
80	19.4
60	20.8
40	24.5
20	38.0

The trials show that this engine, using highly superheated steam maintains a very high standard of efficiency in regard to steam consumption throughout a large range of power, from full power downwards. A steam consumption of only 18.3 lbs. per electrical unit is a remarkably good result in view of the small size of the engine, and of the fact that it was working with steam of a pressure too low to take full advantage of triple expansion, to develop economically the engine's full power. The trials exhibit in a striking way the economy of high superheating.

Jeffrey Sorting Belt Conveyor.

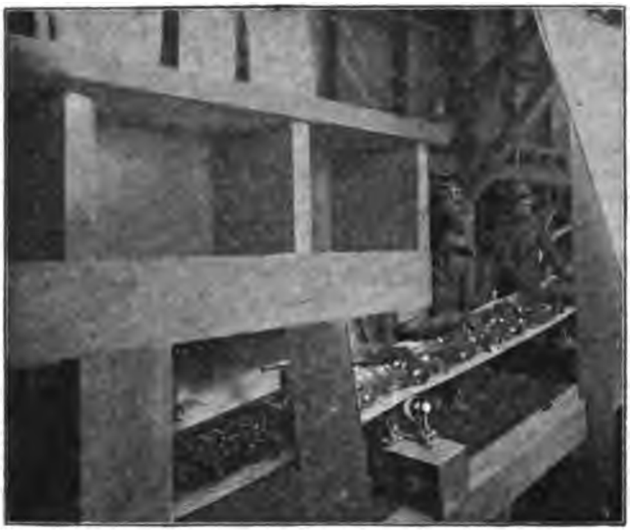
The accompanying illustration shows a Jeffrey "Century" belt conveyor used as a sorting table, at the mines of the Colorado Fuel & Iron Company.

This outfit consists of an extra wide "Century" conveyor belt, having its carrying side re-inforced with an extra thickness of a special rubber covering for resisting the abrasion of the material.

The belt is supported on special troughing carriers, concaving the belt sufficiently to prevent the material from rolling.

The belt is operated at a moderate speed, which enables the pickers to take the impurities from the product while in transit.

These sorting tables are used successfully for different purposes, and for carrying large or small quantities of material from one place to another. They can be operated horizontally or on an incline up to 25 or 30 degrees if desired.



Jeffrey Sorting Belt Conveyor.

The conveyor was furnished by the Jeffrey Manufacturing Company, of Columbus, O., which supplies this class of machinery for the handling of coal, ores, sand quartz tailings, crushed stone, sulphite chips, clay, and for a variety of other purposes. The company also manufactures a complete line of chain elevating, conveying and power transmission macinery. Its new illustrated catalogue No. 67 on "Century" rubber belt conveyors can be had upon application.

An Improved Ladle.

An improvement in a bottom pouring ladle has been devised by Clifton W. Sherman, who has sold his patent to the Pennsylvania Car Wheel Company, of Pittsburg. The ladle is constructed with a pouring opening in its bottom adapted to be closed by a plug valve, consisting of a cylinder of graphite enclosing a metallic rod. This rod is attached to the inner end of a horizontal arm, which is carried by a vertically movable bar slidably mounted in a guide way that is formed upon the outer face of the ladle. The bar is actuated by means of a pivoted lever. To actuate the plug, therefore, it is only necessary to swing this lever, whereupon the bar and arm will be raised, elevating the plug and uncovering the pouring opening.

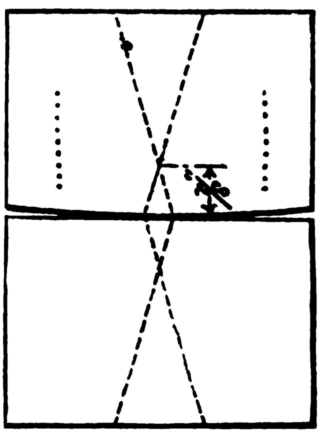
American Manufacturer.

COMPRESSION OF CAST IRON AND STEEL.

THE effects of compression on cast steel and cast iron have recently been the subject of some experiments made prior to the construction of a disappearing gun carriage, with a view of determining the necessary width of rocker reoured to carry the load of 800,000 pounds, or 400,000 pounds on each rocker.

The work was done with two blocks, shaped approximately like the accompanying sketch, in which the lower one had a flat surface, and the upper one was curved to a radius of 144 inches. The physical properties of the steel casting were that it had a tensile strength of 75,000 pounds per square inch, and a limit of elasticity of 35,000 pounds. The cast iron had a tensile strength of about 30,000 pounds. The elastic compression of the two metals was practically the same. Careful measurements showed that, with a load of 400,000 pounds placed upon rocker 12 inches wide, the elastic compression mounted to .0047 inch for cast iron, .0039 inches for cast steel, and .0037 inches for forged steel.

It was also found that the compression extended for a distance of more than 5 inches into the metal, with the probability that it went through the entire block. This loading did not cause any disintegation of the metal, or any permanent set, but it was found that after the load had been removed, the metal returned to a point beyond its original form, giving a minus reading when not under load as though it were subjected to a tensile stress.



Compression of Cast Iron and Steel.

In order to determine the outward movement of the metal a number of micrometer measurements were taken between points on each side of the center lineas indicated by the dots in the figure. It was found that there was a spreading of the metal on either side of the center line, as indicated by the dotted lines crossing each other in the shape of an X. Thus, at the point of crossing of these lines, there was no spread. The spread increased above and below this point, and the neutral point was ⅞ inch from the surface of the contact in both the steel and cast iron.

The surfaces of contact were scraped true so as to bring the bearing as near as possible to the theoretical line. Then, in order to ascertain the width of the surface of contact, tissue paper, having a thickness of .0012 inches, was placed between the surfaces and the load applied. In addition to the fine line, showing the contact of the metal themselves, there was, outside of this line, a band varying from a width of inches under a pressure of 50,000 pounds, to 1.8 inch for steel and 2 inch for cast iron, when the load of 800,000 pounds was used. This band was caused by the exuding of the oil from the body of the metal, and must have been that which soaked into it in the course of making, as the surfaces were wiped as dry as it was possible before the experiments were begun.

The line of contact, too, was narrower at the center of the block than at the edges, showing that the supported metal at the center yielded less than at the edges.

As for the minus reading observed after the removal of the load, that persisted for more than 24 hours after the completion of the experiments. Indeed, it was not determined how long it would take for it finally to disappear.

The experiments are interesting, as serving to bring out some fresh information as to the action of cast steel and cast iron under excessively heavy compression loads, and also as to the reliability of these metals when subjected to such stresses.

AMERICAN MANUFACTURER AND IRON WORLD.

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EDITORIAL COMMENT.

McKeesport's Abandonment—The semi-official announcement in formal shape from the directing officials of the National Tube Company that the pipe and tube works at McKeesport are to be abandoned when the new plants at Lorain and Neville Island are ready for operation is serious enough to produce anxiety among the residents of that town but must not be taken too seriously when viewed from all angles according to published reports. Emphasis is laid upon the claims of some of the Eastren members of the directing body of the United States Steel Corporation that McKeesport is undesirable as a location for its big tube plant because McKeesport is a town of anarchists This was brought out, it is said, by the conduct of the steel workers during the strike last summer and of Mayor R. J. Black during the same period. Hence McKeesport must be abandoned. The Eastern men do not care to take risks with anarchists. That is the way the explanation runs.

Without discussion it may be set down that neither Mayor Black nor the steel workers of McKeesport are anarchists and have never conducted themselves as such if any one of the million definitions of an anarchist is to be taken as a standard. During a strike an anarchist is usually one who indulges in disorder or "strenuousness" to gain a point, but the term is used in much the same sense that the spell binder uses worse terms to describe his political antagonists. The use of the word and the word itself must not be taken too literally. The anarchist charge may be safely dropped.

The better explanation of the possible "abandonment" of McKeesport if one can bring himself to believe that McKeesport ever will be abandoned lies in the statement that the owners of property contiguous to the plant demanded higher prices for their ground than the Steel Corporation is willing to pay and make extensions to the tube works. Options are said to have been returned and the purpose of enlarging the plant given up. Then comes the story that McKeesport is to be abandoned. It is unreasonable to believe that the big tube works is to be dismantled and abandoned either because the National Tube Company does not agree with Mayor Black in his views on sociology or because the town is filled with "anarchists." The word has been so abused and its meaning so distorted by thoughtless discussoin that it has become almost meaningless. The United States Steel Corrporation will never throw away large sums of invested money because of a difference of views. When the millenium arrives perhaps the employers will agree with their employes and in the meantime there will be no sacrifice of money because of the difference in opinions. If the tube works is removed from McKeesport the change will not be made because of that reason.

The Tube Company may refuse to make extensions on ground that is too high priced but mere sentiment will have no part in the move.

The Emergency Buying—The offering in the American market of Continental pig iron, presumably of German make, has directed attention to the quality of the article, the approximate analysis of one of these lost being as follows:—

	Per cent
Silicon	0.5 to 1.0
Manganese	2.0 to 3.0
Phosphorus	2.0 to 3.0
Sulphur	0.05 to 0.12

It may not be entirely fair to assume that this is a regular sample of commercial basic Bessemer pig iron in the German market. But it is certain that with manganese running from two to three per cent in the pig iron the resulting steel must be very hard—and this is the fact as American rolling mills which have bought German basic Bessemer steel can testify to their sorrow. Another lot of somewhat similar iron has been offered, with a better analysis, the silicon being 0.2 to 0.4 per cent; manganese only from 0.1 to 0.2 per cent, and phosphorus between 2.3 and 2.4 per cent. Even if sand cast such iron could be used so far as the silicon goes, the manganese is satisfactory, but the phosphorus is extremely high. The sellers, however, want between 65 and 75 cents more per ton for this iron than for the other, running higher in manganese.

PERSONAL MENTION.

J. C. Maben, the newly elected president of the Sloss-Sheffield Steel & Iron Company has taken hold of the work. He states that it was not his idea to change any policy heretofore adopted by the company. It is his intention, he said, of making changes only in positions made vacant by resignations.

The position of general furnace manager for the Sloss-Sheffield Company has been offered to John Dowling, formerly manager of the Bessemer division of the Tennessee Coal, Iron & Railroad Company. It is believed he will accept the position.

Gentry Hillman formerly in charge of the city furnaces of the Sloss-Sheffield Steel Iron & Company, has accepted the position of furnace manager of the Tutweiler Coal & Iron Company the Vanderbilt furnace.

Temple Tutweiler, formerly in charge of the Vanderbilt furnace, has accepted a position at the Ensley furnaces under Superintendent J. W. Shook, of the Ensley division of the Tennessee Coal, Iron & Railroad Company.

It is generally believed in the Birmingham district that at the annual meeting of the Tennessee Coal, Iron & Railroad Company to be held in Tracey City. Tenn., and New York city, this week, Don H. Bacon, chairman of the executive committee, will be elected to the presidency of the company, vice Nathaniel Baxter, Jr., who resigned several months since.

OBITUARY.

JOSEPH PARKE McCLELLAN—Joseph Parke McClellan, a well-known master mechanic and electrician of Pittsburg, dropped dead from heart failure in Bluefields, W. Va., April 27. He was master mechanic at the Graham Iron Company's work, Graham, Va., and had walked to Bluefields, two miles away, during the after noon. After short stay there he started back but got only a few steps on his way. Mr. McClellan was 45 years old and a son of Joseph McClellan of Philadelphia, and at one time connected with James Wood, Sons & Company, iron merchants of this city. He received part of his early education in this city and entered business here 15 years ago. He was at various times connected with the Standard Manufacturing Company and other well-known concerns.

Concentrating Bridge Plants.

The American Bridge Company has decided to concentrate its bridge works in the Western district, comprising the Lassig and American plants at Chicago, the Lafayette plant at Lafayette, Ind., and the Milwaukee, Wis., plant, and erect a new plant at Chicago on the lake front. The total capacity of the four consolidated plants is 90,000 tons annually. The Toledo, O., plant will be kept in operation at its present location. The new Chicago works are to be a exact duplicate of the proposed Economy plant in the Pittsburg district. The plant will be about one mile long, and will be so arranged that material can be handled quickly and cheaply without hand labor. The machine shop, designed for Economy will be duplicated at Chicago. The work will be under the direction of Chief Engineer James Christie, who has designed the plant for Economy.

McKeesport's Abandonment—The general directing officers of the National Tube Company have formally announced that with the building of new tube mills by the United States Steel Corporation, probably at Neville Island and Lorain, the tube plant at McKeesport may be abandoned. The company had options on 25 acres of ground near the works upon which it was proposed to build extensions, but it is said the options have been returned and the project postponed or relinquished. The company proposed to increase the daily capacity from 1,000 to 1,500 tons.

Chain Company Expanding—An addition to the large manufacturing district in South Columbus is being made by the Columbus Chain Company. The company has awarded contracts for two factory buildings, which will give a floor space of 30,000 square feet, and more forges than any individual chain factory in the United States.

The company has its own switches leading into its factory, and the Toledo & Ohio Central Railroad Company is putting in additional tracks to accommodate the increased facilities, making a total of 1,400 feet, which, when completed, will accommodate on the company's own tracks' 25 cars.

The Ashtabula Tonnage—The custom house report for Ashtabula Harbor in April, just completed, shows that 255,952 tons of iron ore were received and 87,662 tons of coal shipped. Of the ore received 27,135 tons came from the new Canadian ore fields of Michipicoten. Of the coal shipped 7,662 tons went to foreign ports. The foreign trade was the largest of any month of April in the history of the port.

IN AND ABOUT PITTSBURG.

The St. Clair Furnace Company has given a contract to the McClintic-Marshall Construction Company, of this city for a steel railroad trestle, from the level of the terminal railroad system of the St. Clair works, at Clairton, over the steel ore-storage bins from which the furnaces are to be directly fed with iron ore.. The trestle will be 360 feet long with 12 separate spans. Extending from the trestle overhead will be a system of tracks, from which the ore in steel hopper railroad cars will be dumped into the steel bins. These bins will discharge the ore into small hoppers which will be carried by the conveying system of the Brown Hoisting Machinery Company, of Cleveland, O., to the furnaces.

An application for a charter will be made May 26 by the Hukill-Hunter Company, with $50,000 capital stock. The object of the company is to engage in the mill, mine and contractors' supply business. The building at 20 Wood street, this city, has been leased and will be equipped to once. The incorporators of the company are James L. Hukill president of the Pennsylvania Malleable Company, Richard J. Evans, general manager of the Franklin Manufacturing Company, and Robert F. Hunter, of Joseph Woodwell & Company, this city.

The Sharon Steel Company, controlled by Pittsburgers, broke all previous records in production in its open-hearth department last month. This department turned out in April 18,806 tons. There are eight furnaces in the department and not all were active all of the time, some undergoing repairs. In the production of this steel there were 354 heats. In the month the best daily record ever attained was also reached. Output in one period of 24 hours was 971 tons of openhearth steel.

The motor department of the Lorain Steel Company's plant, Johnstown, was sold a few days ago to the Westinghouse Electric & Manufacturing Company, of this city. The new owners took immediate charge and will conduct it under the name of the Lorain works. At present it cannot be said definitely what the Westinghouse people will do, but it is said that the department will be maintained there for the present at least.

Suit has been entered in the United States Circuit Court by the Standard Sanitary Manufacturing Company, of this city, against James W. Arrott, Jr., The plaintiff alleges that in 1900, while the defendant was in its employ, he agreed to turn over to the company the right of a patent for dredgers for pulverulent material, and that he has failed to carry out his agreement. The plaintiff asks that Arrott be restrained from conveying the patent to other parties.

Warren B. Thomas and others, of Johnstown, have bought the tin plate plant at that place and will thoroughly remodel it to take up a new line of business, probably some branch of the iron and steel industry. The purchase includes three acres, and the buildings were also bought, except the main structure of the tin-plate plant. This has been bought by a Pittsbug firm and will be torn down and moved away.

The Real Estate Trust Company of this city, is financing a new company, the Penn Bridge Company of Pittsburg, which is to take over the Penn Bridge Works, of Beaver Falls, and build a second plant in Beaver county, the whole on a capitalization of $450,000. The new Pittsburg company will absorb the Beaver Falls concern for $180,000 in stock, the balance of the $450,000 to be used in erection of the new plant and for working capital. The second plant will probably be built at Colonial.

The Pittsburg Valve & Fitting Company is being organized in this city by members of the Pittsburg Plate Glass Company and others, and a charter will be applied for this month. Ground has been secured at Barberton, O., where it is likely the plant will be located. Plans are being completed which call for buildings to cover two acres of land. The directors of the company include M. J. Alexander, and W. D. Hartupee.

Hyde Brothers & Company, of this city, manufacturers of the "Hyde" water tube boiler, have under construction in various shops about 6,000 horse power of boilers for various uses. They have a contract for 2,000 horse power to be used for blast furnace purposes. The firm contemplates building its own boiler shops in the near future.

A deal has been completed by which the creditors of the Hartman Manufacturing Company have arranged to take over the works of that concern and operate them. Nothing remains to be done but to complete the details of the matter.

The Frank Gilbert Hardware & Supply Company, of Sharon, is being organized to carry on a general supply business. Frank Gilbert, formerly of the Fruit-Ohl Company, of Sharon, will be general manager of the company, which will incorporate with $50,000 capital stock.

An increased output of iron and steel work for buildings, bridges etc. wire and ornamental work and iron fencing has been gained by the Vilsack Martin Company, limited, this city, by a

26x100, foot addition to its plant cn Penn avenue. The company reports an active demand for its products and has installed a 36 horse power gas engine and punching and shearing machinery.

The Seelar Elevator Company, this city, recently incorporated to succeed the Seelar Elevator Works, is having a five story building, 75x100 feet erected at Seventh avenue and Fountain steet, which will be equipped and ready for occupancy in November. The new plant will provide an increased capacity of 50 per cent. The company has a capital stock of $75,000. The Officers of the company are: J. L. Seelar president, L. F. Seelar secretary and D. I. Haines treasurer.

The Stanyon Engineering Company, this city, recenty incorporated sucessor to the Stanyon-Miller Engineering Company, has been appointed Pittsburg agent for the Spicer Manufacturing Company, New Philadelphia, O., manufacturers of furnace castings and floor plates; the Aultman Company, Canton, O., elevating and conveying machinery and the Pittsburg Steel Shafting Company.

The Keystone Electric Company, of Braddock, has retained the Pittsburg Construction & Engineering Company as consulting and designing engineers for its power plant to be built at Braddock. Bids for equipment will be invited in about two weeks.

J. S. McCormick & Company, manufacuters and dealers in foundry equipment and supplies, this city, have completed extensive improvements to their plant at Mauch Chunk, Pa., for the production of foundry facings.

The North West Department of the Cambria Steel Company, Johnstown, has been sold to the Barret Manufacturing Company, Philadelphia, the new owners taking charge of the plant on Friday last.

William Stuart, Everson P. Cole and others, of this city, who have organized a company to mnufacture fire brick, will locate their plant at Derry station.

NOTES OF THE INDUSTRIES.

The Calorific Heater & Manufacturing Company, Easton, Pa., is about to locate its manufacturing plant near Allentown along the line of the Barber branch of the Lehigh Valley Railroad. The company has secured an option on four acres of ground and expects to build a main building, 50x141 feet, partly two stories; a foundry building of brick, 100x114 feet, including the boiler house, engine room, etc., and a frame storage pattern building, one story 20x30 feet in dimensions, sheeted with wrought iron. The following machinery will be purchased: Boiler and engine, cupolas, blowers, six traveling foundry cranes, elevators, and scales for cupola, one platform scale, three tumbling mills, one testing apparatus, traveling crane for cleaning department, three radial drill presses, one boring mill, one 36-inch planer, one jointer, jigsaw, circular saw, wood turning lathe, engine lathe, bolt cutter, pipe cutting and threading machine for machining boilers and radiators, pulleys, shafting, hangers and belting machines, benches, hand tools, dies, taps, patterns, flasks, and ore plates.

A new iron and steel manufacturing plant is to be located at Springfield, O., by C. W. Bookwalter and others of that place. Mr. Bookwalter has acquired the sole ownership of patents for the conversion of iron into steel. The patents upon which the project is founded were gotten out by Mr. Bookwalter some years ago and are said to be an improvement on the Bessemer process, whereby the blast is introduced on the side of the converter instead of on the bottom thus preventing the over-oxidation of the metal. The plan is to establish a sort of parent company for the development of the process. The patent makes perfect steel castings with carbon as low as soft open hearth boiler plate.

Work will be started next week on the new furnace to be built at Cleveland, O., by the Cleveland Furnace Company. The company has plans made for two stacks, but only one is to be erected at present. Before the first is in blast, however, and this will be about a year hence, work may be started on the second stack. The stack will have a producing capacity of 400 tons of Bessemer pig a day or three hundred tons foundry pig iron. D. B. Meacham, of Rogers, Brown & Company, Cininnati, O., is president of the new company.

At a meeting of the William Cramp & Sons's Ship & Engine Building Company, Philadelphia, Pa., held on Friday last authority was granted to the officers of the corporation to expend $4,000,000 for improvements necessary at the yard owing to the demands for the construction of larger vessels. More space and tools are also necessary for the proper development of the ship yard, and the stockholders were called to authorize the issue.

The Reading Iron Company, Reading, Pa., has promised a general advance in wages June 1. A month ago the men asked that wages for puddling be raised to $4.50 per ton, with a proportionate increase in the finishing departments. The company agreed to give the puddlers $4.25 but said that the other .men could not be given more at that time. The men said that the request would be renewed May 5 for $4.50 per ton. The company has announced that if this would be allowed to go by the board a general advance for all classes would go into effect on June 1. This was accepted.

The Southern Sewer Pipe Company intends to build at Birmingham a factory for the manuacture of sewer pipe, tiling, etc. The capital stock is $60,000 with power to increase to $200.000. The following officers were elected: President and general manager, S. L. Russell, of Louisville: vice-president and business manager, C. S. Bissell, of New York; secretary and treasurer, J. A. Menge, of New York. Arrangements have been made with the Birmingham Commercial Club for a site.

W. J. Kelly and associates, of Tuscaloosa, Ala., announce that arrangements have been completed for the inauguration of a coal bridge line from Tuscaloosa down the Warrior river to the gulf and thence to New Orleans. The incorporation of the Alabama Barge & Coal Company, of New Haven, Conn., with a capital of $1,000,000 is supposed to have some connection with this project which has been on foot for two years

The Sterlingworth Railway Supply Company, Easton, Pa., has sold to the Chicago Equipment Company the property and business of the brake beam department, which practically puts the brake beam business in the hands of one controlling interest. The company still retains three big departments and contemplates enlarging its plant provided adjoining land can be secured. If not, the plant will be removed to Philadelphia.

The ten puddle and finishing mills of the American Iron & Steel Manufacturing Company's three plants, Lebanon, Pa., are idle because the 1,500 iron workers employed there voted to strike. A month ago the men made a demand for an advance from $4.00 to $4.50 ton for puddlers. The company offered $4.25 which the men accepted. On Saturday they demanded $4.50. The company announced its refusal of the demand at once.

The Superior Chain Company, of Marysville, Pa., has been organized with a capital stock of $25,000. The officers are: Logan A. Marshall, of York, president; John W. Beers, vice president; S. S. Lieibey, treasurer; J. Harper Seidel, secretary; George B. Walker, general manager. The directors are: L. A. Marshall, John W. Beers, E. B. Leibey, John A. Seidel, E. J. Sellers, P. F. Duncan, W. H. Leonard, H. J. Deward, Jacob S. Bitner.

A sympathetic strike of the York, Pa., chain makers was started a few days ago and 118 men are now out in the two plants of the Standard Chain Company. Sixty-eight fires were banked in the Schmidt works and fifty in the Nes plant. Twenty-eight fires are working in the former plant and in the latter few of the men but the winders are at work.

Over 200 men in the finishing department the Penn Iron Company, Lancaster, Pa., struck Monday morning, and 500 men in the mills of the Susquehanna Iron Company at Columbia are out. A little over a month ago the men made a demand for $4.50 ton and a thirty-day compromise at $4.25 was effected. This time expired on Saturday, when the men renewed their demands for $4.50, which were refused.

Application has been made by Henry L. Carter, W. F. B. Stewart, Henry W. Stokes, Samuel Mason and James H. Morris, for the charter of an intended corporation to be called York Haven Electric Transmission Company, York Haven, Pa., the character and object of which is conducting, transmitting, delivering and supplying electricity.

Fine specimens of clay have been discovered at Mertztown, Pa. Hartzell, Koch & Seip, who have leased the tract will erect an improved building for the manufacture of clay. The building will be 120 feet long and 60 feet wide Shafts of 60 feet have been dug with no limit of clay, and drifts of 70 feet have been tunneled North and South of the main shaft.

Prospects for the early construction of the Alabama Central Railroad which has been projected from Decatur to Jasper in Walker county, Ala., are said to be good. The Central people are also credited with having gotten control of the American Bridge Company's plant at Decatur, which was used for some time as a car making plant by the United States Rolling Stock Company.

The Crozer Coal & Coke Company, Elkhorn, W. Va., is doing a good deal of improving at its works. It has 50 new ovens under construction and is walling up the creek banks to protect the ovens against high water. The company is also building a new steel tipple which is the second one of the kind in the coal fields.

The Philadelphia Trust Safe Deposit & Insurance Company has conveyed to Burnham, W. l m & Company, Phildelphia, Baldwin Locomotive works, the Northeast corner of Eight-

eenth and Hamilton streets for \$60,000. The site will be occupied by an extension of the locomotive works.

The Ohio Solid Steel Company has been incorporated by Martin Backes, Martin Bonnell. T. E. Young and 17 others, all of whom give their address as No. 419 Market street, Camden, N. J. The charter of the new company is a very broad one enabling the concern to engage in the manufacture of all grades of iron and steel.

John C. Kelly, Philadelphia, will erect a large addition to the iron foundry of the Creswell & Waters Company, at Pulaski avenue and Ruffner streets, Nicetown. It will be a one-story brick building 288x118 feet, with a wing, 20x32 feet.

A strike of foundry laborers at Albany, N. Y., has tied up two foundries and threats are made that the men in the other foundries will be called out. The men asked an increase of wages from \$1.50 to \$2 per day.

The Tatnall Engineering Company, Philadelphia, will erect a radial brick chimney, 42 inches in diameter by 90 feet high, for Sheip & Vandegrift, at their new plant, No 81, Lawrence street, Philadelphia.

The Louisville & Nashville railroad is building a branch line of road from Abernant to the mines of the Davis Creek Coal & Coke Company, of which W. E. Leake, of Birmingham, is president.

A large extension is being built to the wire nail and rod mills of the Sharon Steel Company at South Sharon. The building are nearing competion and the machinery has been ordered.

Work has been resumed in the pressed steel car plant of the Southern Car & Foundry Company at Wylam and rapid progress is being made in the construction of the foundations.

The Youngstown Foundry & Machine Company, Youngstown, O., has purchased additional ground. The company will use the land for future improvements at its plant.

Puddlers at the Glasgow Iron Company plant at Pottstown, Pa., have been given an increase from \$4.25 to \$4.50 per ton, the highest rate paid for puddling here in 20 years.

William Steele & Sons, Philadelpia, have posted plans for a one-story brick addition, 98.4 by 50 feet, to James Barker's foundry, at Sixth and Cayuga streets that city.

A public sale of the real estate, plant, machinery, materials and all other sets of the Hartman Manufacturing Company, New Castle, Pa., will be held May 8.

W. Copeland Furber, Philadelphia, will soon send out plans for a proposed large manufacturing establishment, to be built in Wilmington, Del.

It is understood that the erection of a plant for the manufacture of railway frogs and switches at Anniston, Ala., will soon commence.

The city of Bessemer has let the contract for the building of sixteen miles of sanitary sewer to W. J. Long, of that city, for \$36,750.

The Norristown Electric Company, Norristown, Pa., intends erecting a new power house, 52x140 feet, one-story high.

Alterations and additions are to be made to the rolling mill of the Midvale Steel Works at Nicetown, Phialdelphia.

The Heine Safety Boiler Company will enlarge its plant at Pheonixville, Pa., almost doubling its capacity.

The Main Belting Company, Philadelphia, contemplates the erection of an addition to its plant.

WEST VIRGINIA NEWS.

The Virginia & Atlantic Railroad Company has been organized by Ralph E. Hiner, V. L. Black, James F. Brown, Melcolm Jackson and others, of Charleston, with capital of \$200,000. The company proposes the construction of a road from a point on Dry Fork and Tug river down that stream to connect with the Norfolk & Western.

James B. Hoggin, of New York, has bought the works of the Flemington Coal Company for \$250,000. Haggin was the complainant in the foreclosure suit. The company was bonded a few years ago for \$3,000,000. Disagreement among the stockholders was the cause of the trouble.

The war department has ordered the B. & O. to tear down the Fairmont Morgantown & Pittsburg division bridge near Fairmont. The move is necessitated by the locks and dams improvements. The B. & O. may bridge the river near a Rivesville.

Thomas G. Brady, of Clarksburg, is looking for a location in that district for a steel plant Eastern capital will construct.

Eastern capitalists have begun construction on a plant for the West Virginia Refining Company, near Clarksburg.

The Fairmont Coal Company has just bought the Riverdale Coal works at Shinnston, for \$100,000.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The quietness that has characterized the markets for the past three weeks is maintained but there is showing now a dispositon among some of the smaller buyers to get scared again and place contracts for next year's deliveries both in iron and steel. The buying is not directly for delivery next year, that is to say the contracts which specify shipments during the first quarter of 1903 are not standing alone but are a part of contracts which embrace deliveries from July this year to the end of March 1903.

Practically there is no more spot iron but there is some tonnage among the merchant furnaces available for delivery during the third quarter and considerably more available for shipment during the last quarter.

The ruling rate for Bessemer for delivery upon July is from $19.50 to $20 at valley furnaces; for delivery during the last quarter the quotation is $18.50 to $19.00. The figures quoted for delivery during the first quarter of next year are $19.00 and $19.50 at furnace. For prompt delivery of mill iron the quotation that is paid in actual sales is $19.25 at valley stock, equivalent to $20.00 at Pittsburg.

Billets are still out of the market except for contract delivery and for an ocasional small lot at the highest price, from $30 to $35, Pittsburg base.

In the finished lines the feature is the contracting for delivery of material, in particular plates and structural during the first quarter 1903. The extension of the contracts into next year at prices said to be on a level with those ruling today is taken to mean that the buyers are becoming fearful that if they do not get into line early there will be the same trouble in securing material that was experienced this spring when the shortage began to show itself. There does not appear to be any real reason for this fright as, with the passage of time, the conditions be bound to become easier in all lines. If the steel tonnage producing capacity is being extended the blast furnace capacity is also undergoing improvements tnat will aggregate about five per cent of the present total of pig iron.

It is only fair to say that the tonnage that has been run into next year's business is relatively small but sufficient to indicate that the permanences of the situation is not to be lightly disturbed. The further point may be emphasized that with the best endeavors of the steel plants the tonnage that will be forced over into next year promises to be heavier than that of 1901 which was forced into 1902; The importation of German material in the shape of billets and of pig iron from Great Britain has had the slight effect of stopping up few of the holes of consumption but the effects have been so slight that atfer all the actual difference to the American markets may be put down as almost nothing. That movement has almost reached an end partly through the question of prices and partly through the difference in the character of the material which makes the foreign raw material to some extent undesirable.

Under ordinary circumstances it is safe to say that the material would not be accepted by American consumers of raw steel but at present when the spot supply is so much overdrawn the willingness to get material overcomes weaknesses that would be an effectual barrier at other times.

Quotations as a whole are unchanged: What has been said of other weeks that sellers of material may name their own prices for delivery holds good of this week. Quotations vary with each sale or attempt to buy.

CURRENT QUOTATIONS:

Basic	$20 25		Splice bars	1 50	
Bessemer		20 75	Angles	1 60	
Charcoal, hot	28 00		I beams	1 60	
Charcoal, cold	25 00		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 7[illegible]
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	32 50		No. 1 cast	17 00	17 50
Open hearth	34 00		Iron rails	25 00	2[illegible] 00
Steel bars	1 50		Car wheels	18 00	19 00
Iron bars, refined		2 00	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—Transactions in the iron and steel market have been on a limited scale during the past week, chiefly because the mills and furnaces are so well sold up that they cannot take any new business. There is not a great deal of pig iron unsold for the balance of the year, and while there will doubtless be some steel, the producers are not willing to sell yet, or until they have entirely covered for their pig iron, and know better what the scrap market is likely to do. Finished products are sold ahead for several months, and in the case of steel rails and structural material clear through the year. There is, of course, a great deal of unsold capacity in sheets, tin plates, bars plates, etc., but for the next two or three months the mills are very well filled, and for the second half buyers are not yet ready to take hold, nor are the mills anxious to sell until they learn more of the probable course of the market.

Quotations in the local pig iron market for

r and June shipments show a wide divergence, for deliveries during the last half of the r they are beginning to be fairly uniform. ces during the week have been somewhat ir- ılar. May and June deliveries at from $20 20.50, three following months, $19.50 to $20; for the last quarter, $19 to $19.50.

ıles have not been on a very large scale dur- the week, for the reason that the great bulk equirements are already provided for, and, eover, there is little or nothing for sale.

verage prices for the standard brands of thern iron would be about as follows for ladelphia and near-by points for May and e shipments, and as above stated for later s: No. 1 foundry, $20.50 to $21.50; No. 2 ndry, $19.75 to $20.50; gray forge, $18.25 18.50.

rices for steel billets are nominally $33.50 to Inquiries are good, but steel is very hard et at present.

he demand for all forms of finished iron and l is fully maintained, and in some lines it is ctically impossible to secure deliveries inside hree or four months. Prices are very strong, depend almost entirely on dates for deliver- but the average would be subject to $10 or premium for prompt deliveries of structura- erial.

ıe market for steel rails is exceedingly firm, as an indication of the situation may be d the case of a mill which was forced to de- e an order for 10,000 tons, for delivery be- ing as late as December. Standard sections still quoted at $28 at mill.

CURRENT QUOTATIONS:

fdy, Sohn.....	$12 50	13 50	Tank	1 80	
fdy, Sohn.....	12 00	12 50	Steel smelt'g scrap	14 00	
fdy, Sohn.....	11 50	12 00	No. 1 wrought......	14 00	
forge, Sohn..	11 00	11 50	No. 1 cast.............	12 00	
s.....................	28 00		Iron rails.............	16 00	
bars..................	1 70		Car wheels...........	15 00	
bars.....	1 70		Cast borings.........	6 00	
rails..............	38 00		Turnings.............	6 00	
s.....................	1 75		No. 26 sheets.........	3 00	3 50
plates..........	1 90		No. 28 sheets.........	310	3 50
ox................	2 00				

w York—Rogers Brown & Company—The ıres commented upon so frequently in the weeks continue in all the iron markets. De- d is in excess of supply. But supply is in- sing. And the scare that influenced buyers ver indiscriminately a month ago has passed r. There is therefore a quieter and more ed condition all round, but no weakness in s. A little early delivery iron continues to up, partly through importations, and for premium figures are readily paid.

w furnace schemes, as we have before men- d, continue to engage attention. The latest lation covering furnaces actually begun, ranged for beyond any question, makes a of twenty-seven, with an annual capacity of fully 2,500,000 tons. If to this is added a ten per cent increase in output of existing plants, through the constant improvement that is the order of the day, it will be seen that all previous estimates of production are likely to be exceeded.

It is unofficially reported that the United States Steel Corporation is also planning extensive building of furnace West and East to become independent of the open market. This may well be doubted, in view of the obvious necessity that would be upon the owners of such properties, when deprived of their leading customer to build steel works of various kinds to use up their product, thus creating an important competition in the field of finished forms, wherein the Corporation of course makes its largest profits.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City.......	$19 50	21 00	Angles....................	2 00	2 50
No. 2X fdy Jersey City..................	17 65	20 00	Tees......................	2 00	2 50
No. 2 plain Jer. C.	17 25		Zees......................	2 00	2 50
Sohn. 1 fdy N. Y..	21 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y......	20 00		Com. base, bars per 100 lbs.........	1 65	1 70
No. 3 fdy N. Y......	19 50		Refined base, bars	1 85	1 90
No. 1 soft..........	16 75		Bands, base..........	2 40	2 50
No. 2 soft............	17 00		Norway bars.........	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes....	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.....	2 30	2 40	Old T rails, iron f. o. b. cars........	20 00	21 00
Sheets, blue annealed, 10..........	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs.........	1 90	2 00	No. 1 wro't scrap iron f o b cars....	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock............	2 50	2 50	Old wrought pipe and tubes..	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10		Old car wheels, f. o. b. cars..........	16 00	17 00
Beams and chan'ls 15-in & under....	2 00	2 50	Old ham. car axl's f. o. b. cars.......	22 00	23 00
			Wrought turnings deliv. at mill......	11 50	12 00

Chicago—The Western markets for pig iron are bare of supplies. The South Chicago Furnace Company has let contracts for the construction of a third furnace, but the work will not be completed for over a year. It is the common experience for furnacemen to be behind with their deliveries and they are not gaining in this respect. The demand for spot iron is moderate but nevertheless it exceeds the supplies and values keep rising. No. 2 local foundry has sold as high as $22 but the usual range is about $20 Demand for further requirements is slight, but the opinion is that much iron will be wanted for shipment during the last half of the year. But as little is offered, the melters are not forcing prices by endeavoring to buy against an unwilling market.

Store trade in finished material is not so keen as it was a month or two ago. There is no change in the general conditions, which are those of extreme scarcity, but while prices are very firm they are not this week rising any higher. But it is at best a truce. No one knows what the future will bring forth. The large producers are undoubtedly trying to keep prices down to or near the present levels.

Iron bars are in good demand, and their advance over steel bars is maintained.

Old material is not active. Holders are offering ...e and consumers do not appear to be eager to buy. The lull may be temporary, but while it lasts the market has greater steadiness than it has shown for months.

CURRENT QUOTATIONS:

Bessemer	21 50	22 00	Sheets 26 store	2 25	2 40
Gray Forge 1	20 50	21 50	No. 27 ..	3 35	3 50
Northern 2	20 00	21 00	No. 28	3 45	3 60
Northern 3	19 50	2 50	Angles	1 75	
Southern 1	19 65	20 65	Beams	1 75	
Southern 2	19 15	20 15	Tees	1 90	
Southern 3	18 65	19 65	Zees	1 75	
Forge	18 15	19 15	Channels	1 75	
Charcoal	22 00	23 00	Steel melt'g scrap	17 00	18 00
Billets, Bessemer	32 00	34 00	No. 1 r.r. wrought	20 00	21 30
Bars, iron	1 86	1 95	No. 1 cast, net ton	15 00	16 00
Bars, steel	1 75	1 85	Iron rails	24 00	25 00
Rails, standard	28 0		Car wheels	19 00	20 0
Rails, light	32 00	36 00	Cast borings........	8 50	9 00
Plates, boiler	1 90	2 00	Turnings........	13 00	14 00
Tank	1 75	1 80			

Cincinnati—There has been scarcely any business in pig iron, because none of the furnaces have any to sell. They have been endeavoring to fill old contracts and have not been able to accept new ones. Consumers have been supplied with a few small lots, that they have been compelled to have, to finish up their work on hand, and this has been the extent of the movement. The market has been strong, with no attention given to the Birmingham basis.

It is reported that iron scrap rails have sold as high as $26. Scrap of all kinds is scarce and with a strenuous demand from melters and also an insistent inquiry from dealers, who have sold short, the tendency of price is still upward.

Demand for structural material continues heavy, those having any to offer receiving high prices. We quote jobbers' price from store on angles three to six inch $2.50, angles under three inch $2.00. Beams and channels 15 inches and under $3.00; over 15 inch $3.10; tees $2.50; Z's, $2.25.

CURRENT QUOTATIONS:

South, fdy. 1........	18 75	$19 25	Standard Sections	29 90	30 90
South fdy. 2........	18 25	18 75	Sheet, 26..............	3 40	
South fdy. 3........	17 75	18 25	Sheets, 27..............	3 50	
South, fdy. 4........	17 00	17 50	Sheets, 28..............	3 60	
Grey forge........	17 00	17 50	Angles, 3 to 6 in...	1 70	
Mottled..............	13 50	15 00	Angles, 1¼ to 2¾..	1 82	
Shn. 1, soft........	18 75	19 25	Beams and Chanls 15 in and under..	1 70	
Shn 2, soft........	18 25	18 75	I b'ms 18, 20 24 in..	1 80	
L. Superior, fdy. 1	22 00	22 50	Tees	1 75	
L. Superior, 2.....	21 00	21 50	Z's....................	1 70	
L. Sup'r char'l c'n	22 00	23 00	1 wrought scrap...	14 00	15 00
Hang'g r'k c'ol, 1 ..	26 00	28 00	Steel mlting stock gross ton..........	13 00	14 00
Sou'n c'ol c w.. ...	20 35	20 60	No. 1 cast..........	12 00	13 25
Jaks'n co., s'v'y 1...	2 50	22 00	Old iron rails g t'n	18 50	19 50
St'l brs base hlf ex	1 72		Old car wheels....	15 25	16 00
Iron bars	1 82		Cast borings	6 50	7 00
Flange plates........	1 80		Turnings....	7 00	7 75
Tank steel	1 70				
Ordinary fire-box.	1 90				
Light rails	30 00				

Birmingham.—Alabama's iron and steel market is in a good condition. The shipments are heavy, the demand encouraging and the production keeps up well. During April three furnaces thoroughly repaired, were put in blast, increasing the production by about 600 tons a day. The month the Republic Iron & Steel Company w.. blow in its new furnace at Thomas. This f.. ace will have a capcity of 250 tons of iron a .. and an electric system will be introduced w.. by saving of labor will be accomplished. A.. expense of $60,000 bins have been constr.. for the stock house. Electric engines wi.. employed in hauling the "buggies" or tram .. loaded under the bins to the incline which .. to the top of the furnace and with the .. power the tram cars will be dumped into .. furnaces.

Quotations in this district have the diff.. grades of iron on the $12 basis of No. 2, foun.. Foundrymen who buy in small lots assert .. some of the manufacturers in this district h.. been getting $14 and $15 for the product r.. along. Some of the larger manufacturers .. that the same quotations which have prev.. for some time are still in vogue and the .. admission made is to better price for the p.. duct is that "immediate delivery" iron c.. mands from $2 to $3 per ton premium. S.. ments are heavy. The West is buying f.. from this section and making inquiry for .. time ahead.

The following quotations are given: No. .. foundry, $12.50; No. 2, foundry, $12; N.. foundry, $11.50; No. 4 foundry, $11; gray for.. $10.50; No. 1. soft, $12.50; No. 2, soft, $1..

During this week the Southern Iron Com.. tee, made up of the railroads hanlding the .. traffic in this section will hold a meeti.. Birmingham. It is not believed that it .. any changes in the present freight rates or .. arrangements.

The steel plant at Ensley is working eight .. the ten open hearth furnaces and turning .. good lot of its poduct. A good sale is being f.. for this steel, no little being used right .. home. The little steel plant of the Rep.. Iron & Steel Company, located at the Birm.. ham rolling mills was incapacitated during .. week by a storm blowing down the stacks. .. plant has been making from 80 to 100 tons .. steel daily, all used right in the rolling mil..

Scrap is in good demand with a high .. prevailing. Foundrymen who buy exten.. assert that the ruling prices for this c.. mm.. is from $7 to $9 per ton.

CURRENT QUOTATIONS:

Foundry, 1............	$20 00	21 50	Girder rails............	32 00
Foundry, 2............	19 50	20 50	Angles, 3" & l'g'r	
Gray Forge............	17 50	18 50	Under 3-inch............	
Bessemer billets...		33 50	T's 3" and larger...	
Open h'rth bil'ts...	35 00		Under 3-inch............	
Steel bars............	1 70	1 80	Heavy plates............	
Refined iron bars..	1 90		Beams and chanls	
Standard rails......	26 00			

Coal.

Pittsburg—The shortening of the number of available cars in the coal trade to help out the ore shipments explains why the lake season has not taken on the proportions expected of it at this time. Movement of coal to the lake ports has been slow and unsatisfactory and the coal men are at sea as regards the prospects of the immediate future. The ore trade is prospering but it is at the sore expense of the coal men.

Cincinnati—Retail prices have been reduced 25 cents per ton on soft coal and 50 cents on anthracite but the market has been dull, closing weak and inactive. Pittsburg afloat is held at 7 cents per bushel and Kanawha, at 6½ to 7 cents afloat. To consumers Pittsburg $2.35, Kanawha, $2.75, smokeless $3.00 and anthracite, $6.50, delivered.

Cleveland—The coal trade is presenting its due proportion of delays. The cargoes continue to come forward slowly and many of the contract boats are being sent to the head of the lakes light, while the demand for wild boats has almost disappeared. This almost precludes the possibility of any discussion of rates. Shippers report that there are fewer cargoes than even contract boats. In addition there are many wild boats seeking loads which are not able to find them. Rates remain stable.

Chicago—The position of West Virginia coals in the Western markets is uncertain by reason of a contest among several fields. This has been made possible by a reduction in the freight rates 25 cents, on most if not all the lines, the selling price at destination dropping by that amount. The reduction is supposed to have disturbed some contracts already closed, and the future of prices does not seem to be assured. There is firmness in the Ohio products and Pittsburg coal has not shared with West Virginia product in the declension of values. Western coals also are to some degree weak. Most of the Western railroads have closed contracts for the fuel for the coming year, at about the prices of last season. Coke is abundant but prices are steady, except possibly for some of the inferior grades.

Coke.

The better weather and decidedly better car supply gave strong gain to the coke trade during the week. Both production and shipments gained materially but the improvement was most noticeable in the shipments to Pittsburg, river and Western points. For the first time in several weeks the movement was well over the 250,000 mark and the promises of the railroads indicate that an even better condition is at hand.

The Masontown field also made strong gains both in production and shipments but the feature of the trade is that more of the ovens in the Connellsville region proper moved into the class of plants working full six days per week against the five which has been the rule for several months past.

A summary of the Connellsville region for the week shows 20,553 ovens in blast and 733 idle.

The following figures show the scope of operations.

Production for the week	224,643 tons.
" last week	224.589 tons.
Increase	54 tons.
Shipments—	
To Pittsburg and river points........	4,042 cars.
To points West of Pittsburg........	5,652 cars.
To points East of Everson............	2.199 cars.
Total	11,894 cars.
Last week	11,638 cars.
Shipments in tons for week........	254,014 tons.
" " " last week........	251.217 tons.
Increase	2,797 tons.
Masontown Field	
Shipments for week	693 cars.
" last week.................	600 cars.
Increase......................	93 cars.
Shipments in tons......	18,018 tons.
" last week................	15,600 tons.
Increase	2,418 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4 60 Stonega, $4.60

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including May 5, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	113,181	54,697
Tidewater........	42,968	11,478
Southwest........	6,851	29,704
Eureka........	3,839	117,719
Buckeye, Macksburg oil........	1,337	59,840
New York Transit........	99,821	
Southern........	95,639	....
Crescent........	14,784	....
Total........	378,420	273,132
Daily averages........	94,542	68,764
Buckeye........ / Indiana Local Division........	165,808	163,380
Daily average........	41,452	40,842

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
April 30....	$1.85	$1.20	$1.20	$0.88	$0.83	$0.85
May 1..............	1.35	1.20	1.20	0.88	0.83	0.83
May 2..............	1.35	1.20	1.20	0.88	0.83	0.83
May 3..............	1.35	1.20	1.20	0.88	0.83	0.83
May 5..............	1.35	1.20	1.20	0.88	0.83	0.83
May 6..............	1.35	1.20	1.20	0.88	0.83	0.83

The Metal Markets.

LONDON—Tin—£130 6s 3d-£127. Sales, 710 tons spot; 1,860 tons futures.

Copper—£52 17s 6d-£52. Sales, 1,425 tons spot; 1,785 tons futures.

Lead—£11 15s-£11 12s 6d.

Spelter—£18 7s 6d-£18.

NEW YORK—Tin—$28.70-$28.30.

Copper—Lake, 12; electrolytic, 12; casting, 11.75-11¾.

Lead—$4.15.

Spelter, $4.45-$4.37½.

ST. LOUIS—Lead—$4.00-$3.97½.

Spelter—$4.20-$4.12½.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	10.75	c
Copper, light bottoms	9.50	c
Heavy Composition	10.75	c
Brass Turnings	7.00	c
Heavy Brass	8.62½	c
Light Brass	7.37½	c
Heavy Lead	3.90	c
Tea Lead	3.70	c
Zinc Scrap	3.12½	c
No. 1 Pewter	19.00	c

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.
Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4 75

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

small lots......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ......33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ......35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.25 per lb., in small lots; lot of 100 pounds, $1.10 per lb.; special price on large lots

Ore Situation at Cleveland.

Delays to boats have become frequent and an annoying to both the shippers and the vess owners. In the ore trade they are most notic able. The workings of the docks have been un satisfactory. There have not been enough car to take the cargoes away and the boats hav bunched badly. Craft are now in port alon the South shore of Lake Erie that will not ge a chance at the machinery until the middle o next week. The offerings of ore tonnage at th head of the lakes is also heavy, and the ship pers are still reporting that they have a surplu of boats.

The services of the union firemen were refused after having been proffered by the men. This was the first incident of its character since the strike was called, and some of the men have been wondering how this would work in the event they decided to go back. The towing company has hired non-union men whom it does not care to throw out of work. This question may also be taken up by the Licensed Tugmen, and become one of their causes for decisive action.

Another interesting feature of the strike came out when it was learned that some of the striking firemen from two other ports have gone to other ports, and have taken positions as non-union firemen, appearing on the pay roll of the Great Lakes Towing Company. Aside from this, the situation has not changed. The men are still obstinate and the general officers of the firemen's organization are claiming big victories, as also are the officers of the Great Lakes Towing Company.

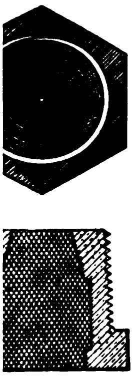
Wire Nail Output.

The production of wire nails in the United States in 1901, tabulated by the American Iron & Steel Association, amounted to 98,803,822 kegs of 100 pounds each, an incraese of 2,569,843 kegs over 1900. The output was produced by 61 establishments as compared with 56 in 1900, and wa largely in excess of the greatest year's production, in 1897, when 8,997,245 kegs were made.

The following table gives the production by States for the years 1900 and 1901:

States-Kegs.	1900	1901
Mass. R. Island and Conn.	212,584	71,5[illegible]
New York	63,466	136,1[illegible]
Pennsylvania	2,158,399	3,118,5[illegible]
Md., W. Va., Ky., Ala., and Ohio	2,516,391	3,633,8[illegible]
Indiana and Illinois	2,195,672	2,716,7[illegible]
Mich., Wisconsin and Cal.	87,467	127,0[illegible]
Total	7,233,979	9,803,8[illegible]

proved Fusible Plugs.

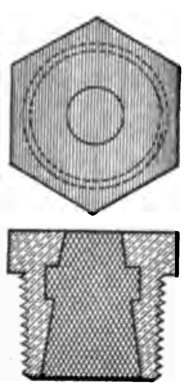


3IDE TYPE

THE recent action of the United States treasury department in enforcing the provisions of Section 4436 of the United States revised statutes, regarding the specifications as to the manufacture of fusible plugs, has attracted considerable attention to this article.

Fusible plugs have been used in boilers for a great many years, and the government, recognizing the important function of this r accessory, requires that all plugs used on rs of steam vessels should be made of bronze have no other filling but pure Banca tin.
ıny plugs have been offered on the market h are filled with fusible alloys composed of r metals, which, although melting at very the same point as Banca tin, were not lutely reliable. Since the disaster at adelphia last fall, the United States steam inspection service of the treasury depart- t has taken cognizance of the fact that in- r plugs were offered upon the market and d a circular requiring that all fusible plugs ld be filled with pure Banca tin and stamp- ith the manufacturer's name, and that an ıvit setting forth this fact should be with the inspector having charge of the r inspection at whatever point the plugs used.

e Lunkenheimer Com- has manufactured fusi- plugs for a number of ;, all of which comply these specifications, having made affidavit 'e the United States nboat inspection ser- , to the effect that its ; comply with those re- :ments, the plugs are oted by all inspectors ıghout the United s.



OUTSIDE TYPE

rewith are illustrated 'orms of plugs; namely outside and inside rns, to be screwed in either from inside of the boiler or from the outside gh the fire box or shell.
se plugs are manufactured by the Lunken- r Company, of Cincinnati, O., who will be d to give further particulars upon applica-

The New Scale.

Wage scales of the Amalgamated Association workers have been settled but there remain demands of importance that must be adjusted with the American Tin Plate Company, the American Sheet Steel Company, the American Steel Hoop Company, and the Republic Iron & Steel Company. Copies of the agreements are being printed for presentation to the manufacturers.

The most important changes affect the length of hours of the workmen in some departments. One of the new clauses to be inserted in the agreement is that "finishing mills be allowed to work three turns when practicable. On finishing mills working or desiring to work three turns, eight hours shall constitute a day's work. Rolling shall not start earlier than 5 o'clock a. m. Monday morning, and first furnace shall cease charging, at 11.30 a. m. Saturday. The last furnace shall not charge later than one hour after the first furnace and close the week's work. On all mills working three turns third roller shall be employed."

The fifth section in last year's agreement was: "That mills may work three turns in 24 hours when practicable." This has been changed to read "that all 10-inch, guide, and hoop mills with one furnace averaging $35 per turn, or with two furnaces, $65 per turn on a 9¼ hour system, based on a 1 cent card that the eight-hour system be adopted.

"That on bar and 12-inch mills averaging 85,000 pounds per turn on two furnaces or 60,000 pounds on one furnace on the 9¼ hour system, that the eight-hour system be adopted.."

New clauses desired for boilers' scale are:

"That where pipe is worked in cinder bottom furnaces, mixed with light scrap it shall be cut three inches long for charging."

"That on all puddle mills where they run buggy, the company shall hire a man to run same."

"When working one-third wrought iron turnings, or one-third light scrap with two-thirds swarth on cinder bottom furnaces, the limit shall be 4,200 pounds."

"When swarth and scrap is worked on cinder bottom and swarth is wheeled in and dumped on a pile, and scrap is wheeled in one ball at a time, scrap weighing 80 pounds or less, that the prices for working such mixture shall be seven-eighths the price of boiling."

"That where hot cylinder clay or ganister, fix, or any other substitute for pulverized ore is used, the price shall be 50 cents per ton extra, except hot ore fix, which shall be $1.00 per ton extra.

"'That all mills where screenings are given to puddlers when working several, that the full boiling price be paid, and that such screenings can not be classed as mixed material."

Besides the new clauses in the boilers' scale the following additions are desired to the old ones: "That puddlers and scrappers shall lose only the amount over the limit of a ball. And when heats must be thrown out, the company shall bloom same if possible."

In the muck or puddle mill scale it was recommended that "On mills averaging 16 tons or less per turn in two weeks, the company shall pay the drag-outs."

The other new features asked are:

"That all piles on board furnaces when average output is 24,000 pounds or over, shall work three turns where the puddle mill works three turns."

"Two bundles shall be the limit of each ball.

"That when light scrap is worked without turnings, 20 cents extra above light scrap shall be paid.

"That when heavy scrap is worked alone on sand bottom, without turnings, the price be 20 cents above the price paid for busheling."

"That when a scrap bloom gets through first pass in the rolls, the scrapper to be paid for the same."

In the knobbling scale and in the heating and shingling scale no changes are desired. The changes asked in the bar and 12-inch scale are that "the words 'all except' on straight two-high bar mill is added to foot notes of bar mill scale."

"To strike out the words 'excessive' in the third line of foot note 8 and the following after the word 'paid' in the last line of foot note—and where the same are subsequently rolled into other sizes, thereby taking the place of billets, and when they are used for plates off a solid or other pile, 10 per cent more than scale price shall be paid."

New clauses asked are that "Company shall pay firemen on all heating furnaces."

"That night turn roller shall receive not less than one-half the straight price for rolling."

"That where a mixed heat of iron and steel is worked in heating furnace, that the price of iron shall be paid."

"That company furnish heater a competent man to help turn iron in furnace on piles weighing 300 pounds or over."

"That the company furnish two straners on guide rounds when worked on a bar mill."

In the hoop and cotton tie scale the new clauses are:

"When working non-uniform billets, such a cuttings, cobbles and scrap yard billets, 21 cent for rolling, 10½ cents for heating and 5¼ cent for roughing and catching each, shall be adde to the straight price per ton for working piles."

"That the price for three-quarter No. 18 sta iron be as follows: roller, $3.53; heater, $1.76½, rougher and catcher, each, 96 cents per ton."

"Company shall pay fireman on all heatin furnaces."

The sheet mill scale provides that "All sheet iron or sheet steel shall be weighed by the company after being sheared and opened, and the company shall furnish the complete weight of each turn to the roller, or put the same in a convenient place."

Important new features have been introduced in the tin mill scale. They are:

1 That screw boys do not bundle any scrap ends, scrap to be bundled by the company.

2. That all tin mills be paid at least every two weeks.

3. That as a counter proposition to the three years' scale we propose to agree on conditions that we get the Cleveland 1900-01 scale and foot notes, with the same conditions as then prevailed, where now practicable.

4. And when in the judgement of the manager and the mill committee the work is too heavy for the catcher, extra help shall be furnished.

5. That when dirty bars are supplied for tin mills the company shall furnish a man to sweep them, and that the crew shall not be held responsible for dirty iron. The crew shall be paid for production per mill for such iron put in by the company.

6. That no more level hand jobs be given in tin mills, and level hand men be singled out as soon as a vacancy occurs.

7. That 10 per cent extra shall be paid for gauge, when doubled three times."

The April Ore Movement—The record of ore shipments in April from the ports of Cleveland, Erie and Ashtabula over the Pennsylvania line was 420,000 tons. This is 70,000 tons more than was anticipated. As a result, the carrying capacity of the roads are overtaxed. At Ashtabula ore is arriving so freely that it must go on the docks, in the absence of orders for shipment. The present month opened with the arrival of four vessels with 9,000 tns of ore from Canadian mines in the North shore of Lake Superior destined for Pittsburg and the Ohio valley. Fortunately, the receipt of new motive power and cars lessens the chances of serious congestion on the lines West.

A MATTER OF HISTORY.

he Chicago, Milwaukee & St. Paul Railway, ularly known as "The St. Paul Road," be- the use of electricity for train lighting in ;. In that and many ways it has been a ieer in the adoption of comforts for the trav- . In building the world famous Pioneer iited trains a mark was set in luxury and ity of cars that has never been equaled, and ably never will be.

Still After Hansen.

The Pressed Steel Car Company, through its attorneys, Knox & Reed, has filed bill in equity against John M. Hansen, in common pleas court No. 1, asking for a receiver to take charge of certain blue prints and of bills of material alleged to have been copied by the defendant while in the employ of the plaintiff company, and on final hearing to have the papers turned over to the Pressed Steel Car Company.

The plaintiff alleges that Hansen, while in its employ, had charge of the drafting department and controlled the making of working drawings necessary in the manufacture of the company's various products, all of great value and advantage in carrying on its business: that these drawings were kept as part of the records of the company and developed and improved from time to time, to represent the best method of manufacturing pressed steel cars; that the blue prints were the result of an expenditure aggregating over $1,000,000, and that their value to any other compaany would be far greater because it would take years to complete them.

It is further alleged that Hansen, while still in the employ of the plaintiff company as chief engineer and assistant to the president, drawing $10,000 year, entered into an arrangement with other employes of the company, H. J. Gearhart and Peter F. McCool, to organize another company to compete with the plaintiff, and applied for letters patent creating the said company under the laws of Pennsyvlania. It is also claimed that Hansen resigned in December 1901, but prior thereto ordered employes of the plaintiff company to make complete set of these blue prints and aslo blue prints of bills of material, used as part of the record of materials required in each kind of car. It is said that over 1,100 blue prints of working drawings and 1,000 sheets of bills of material were copied and delivered to Hansen, which he still retains and proposes to use to assist the newly organized Standard Steel Car Company to compete with the plaintiff. Numbers are attached to the bill.

It is further claimed that Hansen has 2,500 shares in the new company and Gearhart and McCool 250 share each; that they have procured a site and are engaged in erecting a plant.

It is alleged that the use of these drawings will greatly injure the Pressed Steel Car Company and be of great benefit and advantage to the Standard Steel Car Company.

The plaintiff asks that on final hearing the papers be turned over to it and that other relief be given.

LOW RATE EXCURSION TO CALIFORNIA.

During the coming summer frequent opportunities will be offered by the Chicago, Milwaukee & St. Paul Railway to visit California at the lowest round trip rates ever offered with choice of routes from Chicago via Kansas City, Omaha or St. Paul, or going and returning via different routes. Electric lighted trains. Route of the Pioneer Limited. Famous Train of the world. Write for full information to F. A. Miller, General Passenger Agent, Chicago.

STANDARDIZATION OF PIPE FLANGES AND FLANGED FITTINGS.

BY ROBERT E. ATKINSON. (Paper read before the Institution of Mechanical Engineers, England.)

THE lack of universal agreement amongst engineers respecting dimensions of flanges for steam pipes, valves, etc., and general over-all measurements of flanged fittings and connections, is a source of much inconvenience and expense, which could be largely prevented by the adoption of satisfactory standard dimensions for these goods. It is, however, satisfactory to observe as a sign of the times that engineers especially fully recognize the benefits to be conferred by standardization; for by its means not only would the cost of production be reduced, but the efficiency of manufacture would also be increased.

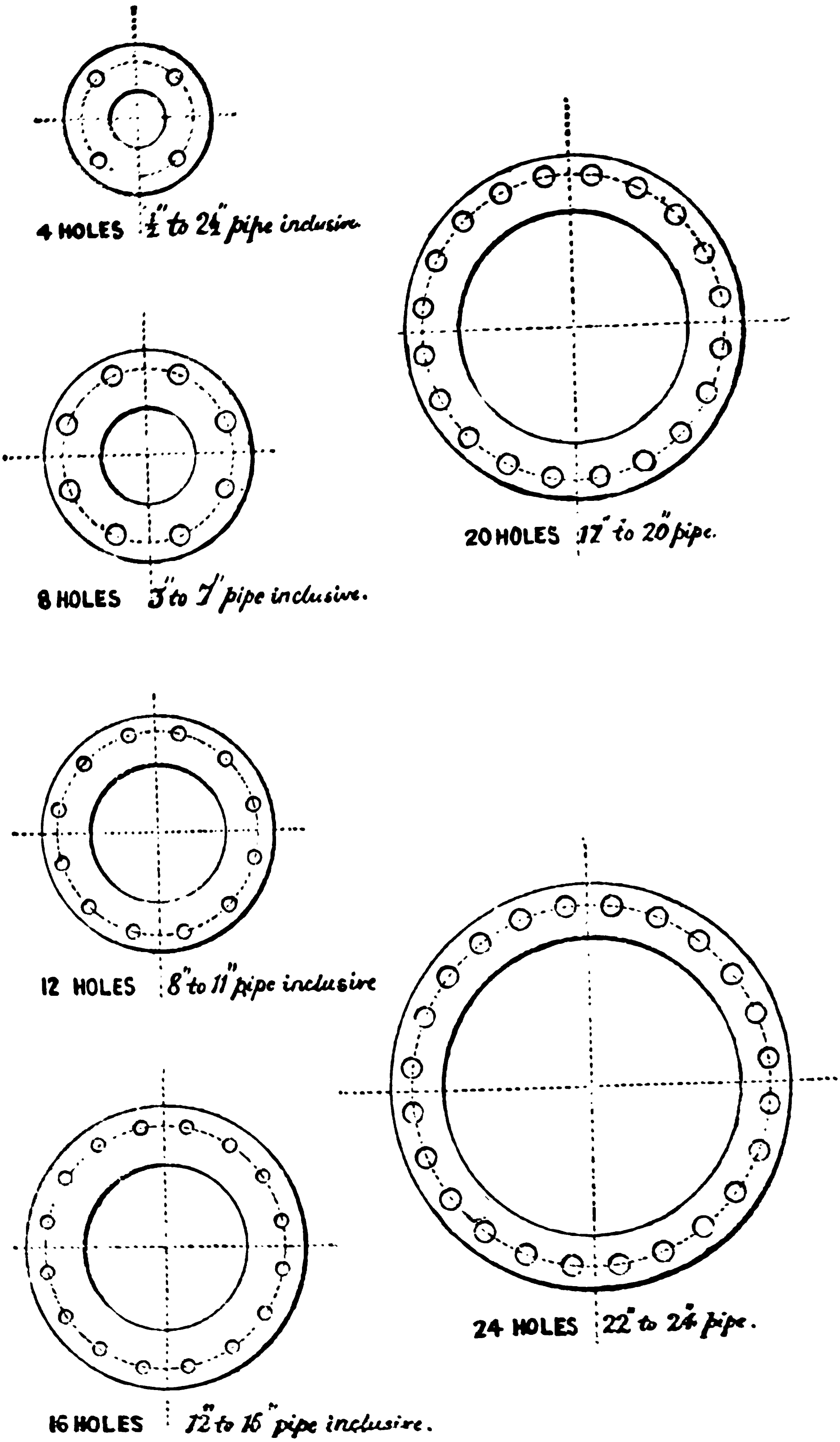
The want of interchangeability is keenly realized in any class of work when break-downs occur. Delays are frequently involved in obtaining renewals of valves or fittings, and in the case of an electrical power installation this may involve serious loss. When public institutions, such as hospitals are concerned, the delay may prove more disastrous than financial loss. Users will at once recognize that, without a common standard, their purchasing area is greatly restricted. Owing to the varied requirements as to the sizes of flanges, methods of drilling, etc., manufacturers find inconvenience and difficulty in speedy production, as it is impossible to commit themselves to the large expense necessary to produce high class patterns and up-to-date machinery, or to carry goods in stock ready for delivery.

In connection with the preparation of this paper, communications have been addressed to upwards of 200 British and foreign firms manufacturing valves and other kinds of flange fittings; approximately 120 of these have replied sending tables of standards used by them, and expressing a sincere desire to see some univerasl standard adopted. Broadly speaking, the variation in the practice of these 120 firms was comparatively slight, but in no two cases did the table sent agree in every particular, there being just sufficient variation to prevent the requisite interchangeability. There was, however, a generally expressed desire for the adoption of a uniform standard.

In some other countries this question has received attention for many years, and has been the subject of exhaustive reports. In 1894, the American Society of Mechanical Engineers, together with the Master Steam and Hot Water Fitters' Association, appointed a joint committee to deal with it, and in July of that year they presented a report containing a table of standard flanges, which was adopted by these societies, and by the principal valve and fitting manufacturers of America. The intention of the compilers of this standard was that it should apply for all pressures; but latterly pressures carried on boilers, etc., have increased very rapidly and it was consequently found that for pressures above 125 pounds the flanges adopted were too small in diameter, and had an insufficient number of bolts. Recognizing these imperfections, the principal valve and fitting manufacturers of America agreed on the additional table of flanges, to apply to pressures 125 to 250 pounds. This was adopted unanimously, the date appointed for the commencement of its use being January 1, 1902.

A definite movement of the same character has also been made in Germany. In the year 1900 the Society of German Engineers, compiled an exceedingly valuable and minute report on standards of pipes and flanges for high pressure steam. This, however, dealt only with flanges for a pressure of 118 to 294 pounds: but some time previously this society, with the Society of Gas and Steam Fitters, jointly compiled a table for flanges of pipes for pressures up to 118 pounds. So far as can be ascertained from enquiries in other countries, no definite standard has been formulated elsewhere; but enquiries have elicited from varicus parts strong expressions of opinion in favor of standardization, as the following interesting extract from the letter of a French correspondent will sufficiently indicate:—

"Unhappily in France we have no regular standard for flanges. It would certainly be the best thing for all heating and mechanical engineers if an international



Position of Bolt Holes In Flanges In Proposed Standard Designs.

standard should be formulated. In our country, where French, American, German, and English valves and fittings are simultaneously in trade competition, it is for engineers a true nuisance with the different sizes of flanges."

In Great Britain most of the leading engineering firms use a standard more or less applicable to their own particular requirements.

With reference to the American standards, it may be noted that the diameters of flanges for pressures above 125 pounds are larger than those for lower pressures. To the author this does not appear to be necessary, and as it prevents the use of a valve or fitting constructed for the higher pressures in connection with low pressure pipes and flanges, it is likely to lead to confusion. The high pressure flanges appear to have been made larger, and the diameter of the bolt circles correspondingly large, in order to provide for the use of very thick material in the pipes. It, however, seems practicable to reduce the diameter of these high-pressure flanges to such an extent that the low pressure flanges might be increased without serious objection, and thus make one standard common to all pressures.

With regard to the bolt holes, in the American standard of both 1894 and 1901, the number of bolts in a flange is in every case divisible by four, and the bolt holes are not drilled on the centre line of a valve or fitting, but symmetrically on each side of it. In the standard for pressures up to 125 pounds four bolts in a flange are considered sufficient for pipes up to and including 4 inches inside diameter, but for pressures above 125 pounds four bolts are used for the flanges for 2 inch and 2½ inch pipes, and eight bolts for flanges on 3 inch to 5 inch pipes inclusive. It, however, appears to the author that these standards would have been more valuable, if the number of bolts as well as the diameters of flanges had been the same for each diameter of pipe, and alike for both high and low pressures.

As to the standards adopted by the German Society of Engineers, there is again a lack of uniformity in the outside diameter of flanges, and in the number of bolts used for various pressures. The flange diameters are the same in both standards for all pressures and for all pipes up to those having an inside diameter of 80 mm. (3 5-32 in.), but beyond these, though the difference is compartively slight, it is nevertheless sufficient to prevent interchangeability. To take as an instance a pipe 150 mm. (approximately 6 in.) inside diameter, in the low pressure standard the flange is 290 mm. (11 7-16 in. diameter), while the high pressure standard flanges is 300 mm (11 13-16 in.) diameter for the sme size pipe. The Germans have not considered it expedient to adopt the principle that the number of bolts should be divisible by four, although there is evidence to show that the advisability of this course was pointed out to the committee of the society referred to. Messrs. Schaffer and Budenburg—who have works in Germany, England, and America—prepared a table which the author understands they submitted to the committee, and in which the bolts are arranged so that in every case the number is divisible by four. The following is an extract from the report of the German Society of Engineers regarding this:—

"It was suggested that the number of bolts to be used should be divided by four. Such suggestion would have led to unsuitable measurements of flanges, and consequently the disadvantages would have exceeded the advantages expected to be derived. As, moreover, such a rule has not been adopted with respect to the standards for the flange pipes for a low pressure, the committee abstain from assenting to this suggestion."

Judging from these remarks the Association of German Engineers in compiling their standard of flanges for pressures to 118 to 294 pounds, appear to have been influenced to a considerable degree by the standard which was already in existence with them for pressures below 118 pounds and generally to have formulated the standard on a purely theoretical basis, without sufficient regard to practical considerations. It is said that difficulty is experienced with these German standards in general use, mainly on account of the number of bolts not being divisible by four, and that valves and other fittings must be kept in stock undrilled, until the manufacturer receives an order from the user, giving the exact position of the holes, which may or may not be required to be drilled in the center line of the valve spindle, or fitting. It may be

added that in speaking of German practice it is understood that the pressures are "absolute" while the English and American are gauge pressures.

In the general course of English practice this difficulty as to the number of bolt holes is equally apparent, six, ten and fourteen bolts being used for various sizes, in disregard of the advantage of the principle of the divisibility by four—a principle which has been adopted with great success for some years by the firm with which the author is connected. On Tables 1, 2, and 3, will be found particulars of the dimensions of flanges designed meet the difficulties already indicated. These tables show flanges adapted to working pressures as follows:

No. 1. 0 to 50 lbs. steam pressure (Table 1).
No. 2. 51 to 150 lbs. steam pressure (Table 2).
No. 3. 151 to 250 lbs. steam pressure (Table 3.)

A large number of drawings accompany this paper, but are not reproduced herewith, showing proposed flanges for pipes from 1/2 inch to 24 inch internal diameter inclusive. Wrought iron or steel pipes and flanges being commonly used for pressure exceeding 100 pounds, sections of flanges constructed of wrought iron or steel as well as cast iron are shown on these plates. Drawings of various forms of flanged joints are also given to which the standard proposed is applicable, some of them being constructed of copper, brass, wrought and cast steel, and other metals. In preparing this standard, the following have been adopted as guiding principles:—

Uniformity in the outside diameter of flanges for varying conditions.
Uniformity in the number of bolt-holes and diameter of bolt circle.
The number of bolts should in all cases be divisible by four.

Table 1.—Propose Standard Flanges (any metal), 0 to 50 lb Steam Pressure; 0 to 75 lbs. Water Pressure.

Inside Diameter of Pipe.	Diameter of Flange	Normal Thickness of Flange in C. Iron	Width of Flange Face.	Diameter of Bolt Circle.	Circum. Pitch of Bolts.	No. of Bolts.	Size of Bolts.	Stress on Each Bolt per square inch at Bottom of thread at 50 lbs.
ins.	ins.	ins.	ins.	ins.	ins.	ins.		lbs.
1/2	3 1/2	7-16	1 1/2	2 1/2	1.96	4	3/8	37
3/4	4	7-16	1 5/8	3	2.35	4	3/8	81
1	4 1/2	1/2	1 3/4	3 3/8	2.65	4	3/8	144
1 1/4	5	1/2	1 7/8	3 3/4	2.94	4	3/8	226
1 1/2	5 1/2	1/2	2	4 1/4	3.33	4	3/8	326
2	6 1/2	5/8	2 1/4	5	3.92	4	1/2	328
2 1/2	7	5/8	2 1/4	5 1/2	4.31	4	1/2	510
3	8	5/8	2 1/2	6	2.35	8	1/2	364
3 1/2	8 1/2	3/4	2 1/2	6 3/4	2.65	8	5/8	300
4	9	3/4	2 1/2	7 3/8	2.89	8	5/8	387
4 1/2	10	7/8	2 3/4	8 1/4	3.23	8	5/8	491
5	10 1/2	7/8	2 3/4	8 3/4	3.43	8	5/8	606
6	12	7/8	3	10	3.92	8	5/8	864
7	13 1/2	1	3 1/4	11 1/2	4.51	8	5/8	1177
8	14 1/2	1	3 1/4	12 1/2	3.27	8	5/8	1034
9	16	1	3 1/2	14	3.66	12	5/8	1303
10	17	1 1/8	3 1/2	14 3/4	3.86	12	5/8	1608
11	18 1/2	1 1/8	3 3/4	16 1/4	4.25	12	3/4	1305
12	19 1/2	1 1/8	3 3/4	16 3/4	3.29	16	5/8	1733
13	21	1 1/8	4	18 1/4	3.58	16	3/4	1365
14	22	1 1/4	4	19	3.73	16	3/4	1584
15	23	1 1/4	4	20	3.92	16	3/4	1818
16	24	1 1/4	4	21	4.12	16	3/4	2068
17	25	1 1/4	4	22	3.45	20	3/4	1891
18	26	1 1/4	4	23	3.61	20	3/4	2120
20	28	1 1/4	4	25 1/2	4.00	20	3/4	2616
22	30	1 3/8	4	27 1/2	3.60	24	3/4	2602
24	32	1 3/8	4	29 1/2	3.86	24	3/4	3097

Table 2.—Standard flanges (any metal) 5 to 1150 lbs. Steam Pressure; 786 ton 225 lbs. Water Pressure.

Inside Diameter of Pipe.	Diameter of Flange	Normal Thickness of Flange in C. Iron	Width of Flange Face.	Diameter of Bolt Circle.	Circum. Pitch of Bolts.	No. of Bolts	Size of Bolts.	Stress on Each Bolt per square inch at Bottom of thread at 50 lbs.
Ins.	ins.	ins.	ins.	ins.	ins.		ins.	lbs.
1/2	3 1/2	9-16	1 1/2	2 1/2	1.96	4	3/8	110
3/4	4	9-16	1 5/8	3	2.35	4	3/8	242
1	4 1/2	5/8	1 3/4	3 3/8	2.65	4	1/2	235
1 1/4	5	5/8	1 7/8	3 3/4	2.94	4	1/2	367
1 1/2	5 1/2	3/4	2	4 1/4	3.33	4	1/2	529
2	6 1/2	3/4	2 1/4	5	3.92	4	5/8	572
2 1/2	7	7/8	2 1/4	5 1/2	4.31	4	5/8	918
3	8	7/8	2 1/2	6	2.35	8	1/2	1093
3 1/2	8 1/2	7/8	2 1/2	6 3/4	2.65	8	5/8	900
4	9	1	2 1/2	7 3/8	2.89	8	5/8	1162
4 1/2	10	1	2 3/4	8 1/4	3.23	8	5/8	1473
5	10 1/2	1	2 3/4	8 3/4	3.43	8	5/8	1818
6	12	1 1/8	3	10	3.92	8	3/4	1746
7	13 1/2	1 1/8	3 1/4	11 1/2	4.51	8	3/4	2374
8	14 1/2	1 1/4	3 1/4	12 1/2	3.27	12	5/8	3102
9	16	1 1/4	3 1/2	14	3.66	12	3/4	2620
10	17	1 3/8	3 1/2	14 3/4	3.86	12	3/4	3234
11	18 1/2	1 1/2	3 3/4	16 1/4	4.25	12	7/8	2826
12	19 1/2	1 1/2	3 3/4	16 3/4	3.29	16	3/4	3487
13	21	1 5/8	4	18 1/4	3.58	16	7/8	2958
14	22	1 5/8	4	19	3.73	16	7/8	3429
15	23	1 3/4	4	20	3.92	16	7/8	3940
16	24	1 3/4	4	21	4.12	16	7/8	4485
17	25	1 3/4	4	22	3.45	20	7/8	4047
18	26	1 3/4	4	23	3.61	20	7/8	4534
20	28	1 3/4	4	25 1/2	4.00	20	7/8	5580
22	30	1 3/4	4	27 1/2	3.60	24	7/8	5700
24	32	1 3/4	4	29 1/2	3.86	24	1	5102

Table 3.—Standard Flanges. Steel (cast or wrought) 151 to 250 lbs. Steam Pressure; 226 to 35 bls. Water Pressure.

Inside Diameter of Pipe.	Diameter of Flange	Normal Thickness of Flange in C. Iron	Width of Flange Face.	Diameter of Bolt Circle.	Circum. Pitch of Bolts.	No. of Bolts.	Size of Bolts.	Stress on Each Bolt per square inch at Bottom of thread at 250 lbs.	Inside Diameter of Pipe.	Diameter of Flange	Normal Thickness of Flange in C. Iron	Width of Flange Face.	Diameter of Bolt Circle.	Circum. Pitch of Bolts.	No. of Bolts.	Size of Bolts.	Stress on Each Bolt per square inch at Bottom of thread at 150 lbs.
ins.	ins.	ins.	ins.	ins.	ins.	ins.		lbs.	ins.	ins.	ins.	ins.	ins.	ins.		ins.	lbs.
½	3½	¾	1½	2½	1.96	4	½	97	8	14½	1½	3¼	12½	3.27	12	¾	3450
¾	4	¾	1⅝	3	2.35	4	½	220	9	16	1½	3½	14	3.66	12	⅞	3155
1	4½	¾	1¾	3⅜	2.65	4	½	392	10	17	1⅝	3½	14¾	3.86	12	⅞	3893
1¼	5	⅞	1⅞	3¾	2.94	4	⅝	378	11	18½	1¾	3¾	16¼	4.25	12	1	3576
1½	5½	15-16	2	4¼	3.33	4	⅝	546	12	19½	1⅞	4	16¾	3.29	16	⅞	4200
2	6½	1	2¼	5	3.92	4	⅝	968	13	21	1⅞	4	18¼	3.58	16	1	3750
2½	7	1 1-16	2¼	5½	4.31	4	⅝	1512	14	22	2	4	19	3.73	16	1	4344
3	8	1⅛	2½	6	2.35	8	⅝	1081	15	23	2	4	20	3.92	16	1	4985
3½	8½	1⅛	2½	6¾	2.65	8	⅝	1483	16	24	2	4	21	4.12	16	1	5672
4	9	1 3-16	2½	7⅜	2.89	8	⅝	1917	17	25	2	4	22	3.45	20	1	5112
4½	10	1 3-16	2¾	8¼	3.22	8	¾	1635	18	26	2	4	23	3.61	20	1	5737
5	10½	1¼	2¾	8¾	3.43	8	¾	2018	20	28	2¼	4	25½	4.00	20	1	7136
6	12	1¼	3	10	3.92	8	⅞	2102	22	30	2¼	4	27½	3.60	24	1	7142
7	13½	1⅜	3¼	11½	4.51	8	⅞	2862	24	32	2¼	4	29½	3.86	24	1⅛	6732

The fact that uniformity is desirable will be appreciated, when it is realized that wrought steel and iron pipes are often connected with cast steel and cast iron valves and fittings, and cast-iron pipes with valves and fittings of gun metal, etc.; and further that flanges are attached to pipes by being screwed. brazed, welded, and riveted. The first point to take into account, if uniformity is to be obtained, is that the flange must be large enough in diameter to allow of a sufficient thickness of metal to enable the pipe, even if of cast iron, to withstand the maximum pressure, and still leave space for accommodation of the head and nut of the bolt. As cast iron is the metal of least tensile strength commonly used in the construction of valves and fittings, it follows that the largest dimensions will be required when this metal is used, with the possible exception of steel and wrought iron pipes constructed with flanges of angle rings riveted on to the pipe. The latter form of construction has been taken into account.

By designing the standard flange suitable for a maximum pressure of 250 pounds it is apparent that, if uniformity is preserved, the flanges for very low pressures will be larger than is necessary for strength; but as a separate standard would otherwise be required for low pressure it would appear to be better to choose the lesser of two evils and permit the slight excess of material for the low pressures. It should, however, be borne in mind that this excessive materail would occur in the diameter only of the low pressure flange, and that its thickness could be made proportionate to its duty. It should be added that no rigid rule has been laid down for determining the thickness of flanges of various metals for different pressures, as the difficulty of doing this will be apparent when cognizance is taken of the composition and combination of metals epmloyed by different makers and in different countries; but an average thickness of metal suitable for the various pressures is shown in the tables. These thicknesses have been calculated with an allowance for the tensile breaking strain of 4 ton per square inch, with a minimum factor of safety of 20. This calcu ation has been based on the assumption that the flanges are flat faced, being those most commonly used, and that on making the joint the jointing material shall extend over the entire face of the flange.

The same principle of interchangeability has been adopted with regard to the number and position of bolts, the proposal being that what difference in strength may be required for the varying pressures should be made in the size of the bolts. The author holds the opinion strongly that no standard can be satisfactory which does not allow for the number of bolts being a multiple of four; without this, inter-

changeability is impossible. Take the case of a stop valve attached to a boiler and the flange drilled for six bolts. If the valve be turned at right angles a new valve would be required. Bends, tees, and the fittings also require to be adjusted to alterations of position. Thus the difficulty follows that all valves and fittings must be kept in stock undrilled, cansing extra labor and expenses in handling again in the works when the position of the bolts is definitely decided: or if the fittings is sent to be fixed to a installation—probably to some distance from a machine shop and proper tools—involving the necessity of drilling by means of a ratchet brace, or similar applince. In the case of tee pieces, the flanges of which have 6, 10,14 or 18 holes, it would be impossible to set the center branch vertically, if it had been drilled to suit a horizontal position. In the proposed standard, in every case the nearest holes to the center lines are arranged equidistant from them. These centre lines would correspond with the centre line of the spindle of valve, the horizontal and vertical axes of a boiler, an engine, a pump, or other machine, and be the same for pipe valves, tees, and fittings. In the case of valves, the top flange or stuffling box is likely to interfere with the insertion of the bolt, and it is therefore not advisable to arrange the bolt on the centre lines. The same difficulty is met with in respect to a bend of short radius.

The sizes of bolts have been calculated assuming an average tensile breaking strain of wrought iron at 22 tons to the square inch, with a factor of safety of six as minimum. In the smaller bolts, ⅜ inch ½ inch and ⅝ inch, this factor of safety is much increased, as an altogether disproportionate strain can be placed on the bolt in screwing up. If special high-class bolts are used of a great tensile strength, the diameter can be proportionately reduced, but in average steam pipe work, ordinary merchant bolts are used, and this quality has been taken into consideration in deciding the sizes given in the tables.

In determining the pressure on the bolts, the steam pressure has been multiplied by the area of the bore of the pipe, and divided by the collective cross-sectional area of the bolts at the bottom of the thread. In the tables the largest circumferential pitch of botls is given as4.51 inches, as in practice it is found that to avoid abnormal thickness of a flanges this dimension should not be exceeded. In the case of cast-iron pipes, of larger dimension were adopted, and the thickness of flanges increased in a corresponding degree, internal strains are apt to be set up at the root of the flange when metal is cooling.

(To de Continued.)

NOTES FOR THE CHEMIST.

Estimation of Titanium—by George B. Waterhouse, in Chemical News Vol. 85. No. 2213. Titanium is an element that seems to have offered great difficulty to steel works' chemists. Although many processes have been submitted, there has not yet been one sufficiently short and accurate to be applied to ordinary use.

In looking over the various gravimetric methods, it is at once seen that three things are common to almost all: (1) Precipitation, by boiling from largely diluted solutions. (2) Fusion with sodium or potassium carbonate. (3) Fusion with acid potassium sulphate.

Precipitation by simply long continued boiling is, however, seldom complete and the precipitate is contaminated with aluminum, silicon, phosphorus and ferric salts, if these are present. The boiling also occupies considerable time, and the precipitate is very liable to stick to the beaker. Boiling then is an undersirable method if another can be found. Titanium may be precipitated from solutions of ammonia hydrate, a fact made use of by Tosh (Chemical News vol. XVI p. 168), by Moissan, (Chemical News, vol. LXXI p. 103) and by others. But for the precipitate to be pure the titanium in solution must be separated completely from iron, aluminum and other elements. But by boiling the solution, having previously eliminated all free acid, except about one per cent, with sodium acetate and 10 to 15 per cent glacial acetic acid, the whole of the titanium is precipitated after brisk and short boiling,

long with any silica and phosphorus present. Feric salts must be removed as they hinder the precipitation.

Fusion with sodium or potasium carbonates does not, as is stated, always render the whole of the silica soluble. Phosphorous, however, is completely soluble as sodium or potassium phosphate. Some processes, as organ's (Chemical News, vol. LXXV, p. 134) rely on the assumption that titanium in acid solutions with the presence of sufficient phosphoric acid, is al| renederd insoluble after baking as a phospho-titanate, but often some is still soluble

Method for Titaniumn Steels or Pig iron—Weigh out 5 grams of drillings into a 20 oz. beaker. Add 50 c c. of strong hydrochloric acid. Heat gently until the sample is dissolved, then boil briskly and evaporate to dryness; bake, with a strong final heating. Cool and add enough strong hydrochloric acid to saturate the dry chlorides (about 20 c. c.) Heat for a few minutes, then add about 70 c. c. water, and boil until all ferric chloide is dissolved. Filter through a small paper, and wash until free from iron, uising warm 1 hydrochloric acid and cold water. Save the precipitate.

Place the filtrat in a 20 oz. beaker, dilute to about 150 c. c.; without heating add little by little, dilute liquid ammonia until the acid is neutralized and there is a faint precipitate. Clear with a few drops of hydrochloric acid; then add slowly about 50 c. c. of 1:5 sodium sulphiite solution. If a precipitate forms or a dark color persists, add a little dilnte sulphuric acid until it is removed.

When the iron is in the ferrous condition, as seen by the color, heat, and as it begins to boil, add 50c. c. glacial acetic acid and a filtered solution of about 20 grams sodic acetate wnich has been heated in a separate beaker. Boil briskly for fifteen minutes. If necessary, allow to settle and filter through a large double paper. Wash the precipitate out of beaker with hot water. Wash and dry this and previous precipitate. when dry, ignite in a deep three-inch platinum dish until all graphite and paper are burned away. Cool in dessicator, mix with about 10 grams pure dry sodium carbonate fuse in covered dish over blast lamp until quite liquid. After a few minutes, cool extract with 150 c. c. hot water. Allow precipitate to settle, filter through hardened paper, wash well with hot water. Open filter on watch glass and wash precipitate into a beaker. Wash paper with hot dilute hydrochloric acid until free from yellow tinge. To the beaker containing the precipitate and washings, add about 10 c. d. dilute sulphuric acid. Cover, boil, and evaporate until fumes of SO_3 are seen. Cool, and dilute te about 50 c. c. Filter if necessary, washing well. Dilute filtrate to about 150 c. c. Add dilute ammonia until a faint permanent precipitate forms, re-dissolve as before, but only add 20 c. c. sodium sulphite solution. When colorless heat to boiling, and add sodic acetate and acetic acid as before. Boil well for 15 minutes. Allow to settle, filter through large double paper, washing paper well around edges with hot water. Dry and ignite in a weighed platinum crucible as TiO_2 containing 60.97 per cent titanium.

Note—The paper concludes with a number of tables giving results obtained by adding known quantities of pure titanic sulphate solution to various weights of iron. Theoretical percentage and results found agree closely.

Novel Screw Plate.

William J. Baker, of Cleveland, has devised an ingenious screw plate, the aim of which is to provide a device for making screw threads upon pipes, rods, and the like, the tool being so formed that after the threads are cut it may be removed directly from the rod or pipe without the necessity of unscrewing it.

He provides a body having the usual rod or pipe-receiving opening, the body being provided on one of its faces and on opposite sides of the opening with flanges forming a guideway. In this guideway are secured the dies, one of which is fastened by means of a cap screw, the other being slidably mounted and having an opening in which is arranged an eccentric This eccentric is journaled upon a suitable pivot bolt and is provided with a handle.

The operation of the device will be apparent. In cutting the threads, the two dies are arranged with their teeth in proper relation over the opening. When it is desired to move the two it is only necessary to unfasten the eccentric which is held by the thumb nut, rotate it to retract the movable die, thus disengaging it from the rod or pipe and permitting the direct removal of the screw plate.

THE BERLIN-ZOSSEN SPEED TRIALR ESULTS.

THE details of the trials of high speeds on the Marienfelde-Zossen line, near Berlin, have been made public finally and are full of interest as the methods are revolutionary in their effects. The trial runs have been suspended for the present to be resumed as soon as the improvements and alterations that have suggested themselves are completed. Further important results may be looked for in the course of this year. During the experiments so far conducted, especial attention has been paid to the following points:

1. Starting and braking at speeds up to 100 kilometers (62 miles.)
2. Running at uniform speeds up to 100 kilometers.

Propulsion at uniform speeds up to 13 kilometers 81 miles.

4. Propulsion by high tension currents at speeds above 130 kilometers.

In order to obtain reliable records, independent of direct observation which would involve personal risk, the carriages were equipped with a number of registering apparatus, particuarly for determinng their speeds, the acceleration in starting. the current tension and intensity, the phase lag, the temperature of the motors and transformers, and the air resistance. Track contacts had been provided at distances of 500 meters (.31 mile,) and they were connected with registering instruments, recording the time intervals in starting and stopping; the brake periods were further observed with the aid of watches.

The power consumption was controlled on delicate instruments located in the central station. The special arrangements required of the carriage equipment occupied the month of September. The respective instruments having duly been tested, the authortlies took the plant over October 3 and 4, and the first trial run followed October 8.

The Marienfelde-Zossen line, it will be remembered, has a length of 23 kilometers 14.3 miles). It is suitable in some respects for high speed tests, thanks to its straight, level course, there being no curves of less than 200 meters (6500 ft.) radius, and no gradients of more than 1 in 200, but neither the rails nor the permanent way can be considered satisfactory. The rails weigh only 33 4 kilogrammes per meter, or 67.5 pound per yard, and they rest partly on wooden and partly on iron sleepers. But as a new roadway would have cost about £25,000, the best had to be made of the actual conditions. As was to be foreseen, the defects in the track manifested themselves at high speeds. So long as the speed did not exceed 100 miles, conclusions were not noticed in the carriages nor in the rails, nor were distortions observed. When the speed went beyond 40 kilometers (87 miles), however, the carriage began to roll a little, owing entirely to the lightness of the permanent way.

The three axled bogies with which the carriges are fitted gave full satisfaction. The motion was quiet and noiseless; the people on board had no unpleasant sensation, and did not feel any jolting due to the rail joints. The experiments would tend to show that rails of 42 kilogrammes per meter (84.5 lb. per yard) would be quite heavy enough for speeds up to 160 kilometers (100 miles). This remarkably quiet motion of the carriages, is, no doubt, largely due to their complete and successful balancing.

The electric current was supplied by the Berlin Electricity Works, at Ober-Schoeneweide. A feeder cable goes underground from the works to Johnnastheal, where the overhead conductors begin. The distance up to the feeder point is eight miles, and the conductor, for the triphase currents consist of three wires, each eight millimeters (0.31 in.) in diameter. There was further a neutral wire leading to the transformers and joined at the rails.

The trolley wires are stretched 18 feet above the track, three the wires being vertically one above the other, and about 3 feet part. They are under tension of 1 ton.

Current was supplied, as a rule, at from 4000 to 6000 volts and from 25 to 50 periods. For the official tests of the plant, a tension of 14,000 volts was applied. During these official tests the trolley wires were sufficiently alive to give bad shocks when touched, even after they had be cut off completely from the feeders of the

central stations. That the telegraph and telephone services were disturbed during these tests need hardly been mentioned under these circumstances.

The pressure of the contact blows against the trolley wires amounted to 4 or 6 kilogrammes (from 9 lbs. to 13 lbs.) Each carriage is provided with two sets of blows, three at either end.

There was very litle sparking at the contact devices, in spite of the high speed of 130 feet per second. Where sparks appeared they could be traced to slight defects in details, and this part of the problem—the current feed to the carriage—seems thus to have received a successful solution. Lateral oscillations of the cariages were noticeable only at speeds below 60 miles. At higher speeds the motion was perfectly smooth, and the passengers did not feel anxious, nor were they troubled by the rapid flight of the objects passed. The kilometers marked on the signal posts along the track of the Stadbahn, which runs parallel to the military line for some distance, could be distinguished, notwithstanding the high speed.

Each carriage, as has been described in detail in other articles on the test, is driven by four electric motors which rest on the four outer axles of the two bogies. The driving wheels have diameters of 51 inches. The carriages, carry 50 passengers, and have a length of 21 meters (69 feet). The wheel pressure is about 7.5 tons.

The heating of the transformers on the Siemens carriage did not amount to more than 35 deg. Cent. (63 deg. Fahr.). Their six pole motors are constructed for developing 250 horsepower at 650 volts. The Allgemeine Elektricitats-Gesellschaft has designed its motors for 430 volts. During the course of the experimental runs the carriage have altogether traveled 3,000 kilometers (1,860 miles). At first, currents of from 6;000 to 8,000 volts were sent to the trolley line at from 25 to 30 periods. For the maximum speed tests up to 100 miles, the tension was raised to 10,000 volts, the frequency to 36 periods, and temporarily even to 13,500 volts at 48 periods. Under these high speeds, however. the rails began to yield both horizontally and vertically, and this was the reason why the tests had finally to be interrupted.

When starting for a speed of 60 miles, full speed was reached within 2,000 or 3,000 meters nearly two miles, the acceleration being from 0.3 to 0.20 meter (5 to 8 inches) per second. These accelerations are not high; on the Siemens Elevated and Underground Electric Railway, at Berlin, which has been recently opened, the acceleration is 0.6 meter (23.6 inch) on starting.

Since, however, rapid starting wears the locomotives considerably, and, since the stations will not be very close on high speed lines, the question of rapid and reliable breaking is of much more importance than that of rapid starting. The carriages are fitted with Westinghouse air brakes, with hand brakes, and with counter-current brakes. The Allegemeine Elektricitats-Gesellschaft had further added an electro-magnetic brake, fed by an independent source of power—a special battery of storage cells on board. The Westinghonse brakes could exert a pressure equivalent to 3640 kilogrammes, equivalent to 95 per cent of the weight per brakeblock. The brake ratio was 1.1002. Both the time and the space interval of the Westinghouse brakes were determined, the air pressure being 6 atmospheres (85 pounds). The original appliances did not answer, and the valves had to be altered in the course of the experiments.

As the brake blocks and also the wheel tires became very hot, experiments were also made with hollow, watercooled blocks. It will be found advisable for high speeds to apply brake discs to the axles, and not to let the brakes act directly upon the wheels, lest the tires should slip.

The hand brakes are, of course, used for emergencies, the carriage should be stopped within 720 metres (2,350 feet,) and the retardation amounted only to 0.6 meter two feet, per second. Braking by current reversal is not to be recommened, as it endangers the motors. The conclusion arrived at is that further means of efficient raking will have to be devised.

When the carriages were allowed to come to a stop without putting on the brakes, from full speed, the retardation resistance was—

$$p=\frac{v}{t}=0.034$$

and the resistance of the carriage—

W =222 Kilogrammes, or w=3.4 kilogrammes per ton of train load.

The calculation yields the value 5.4 kilogrammes. It would appear that we have, at high speeds, to allow for certain momenta which theory has so far neglected.

The results of the brake tests are summarized below:

Speed in Kilometers	Speed in Miles	Brake Interval. Space in Meters	Brake Interval. Time in Miles	Brake Interval. Time in Seconds.
156	96.5	1000	1	6.
110	68.5	500	.31	35
110	68.5	550	.34	32

In letting the carriage come to a stop by itself at speeds between 109 and 106 kilometres (68 and 66 miles,) the time required was 817 seconds, the space 9,600 meters or 5.96 miles; or 952 seconds, and space of 8,300 meters 5.15 miles. The power consumed was exactly determined, as mentioned above, on standard instruments placed in the central station which could be relied upon as giving more accurate renderings than the instruments on board the cars. In the central stations readings were taken every 10 seconds; on board only at intervals of 50, or 30 seconds. The apparatus had been specially standardized for the respective frequencies. The dynamos supplied currents of 6,000 volts, which were transformed up. The instrument measured tension, a current intensity, kilowatts, phase lag, and frequency. The results demonstrated that considerable current losses occurred in the relatively long feeders and the rather slender conductors. These losses would be avoidable in properly designed plants. The energy consumption depends upon the speed in running and in starting; it varied between 400 kilowatts, 544 horsepower and 700 kiilowatts (1,000 horsepower). With 184 kilowatts, a uniform speed of 90 kilometers (56 miles) could be maintained; with 520 kilowatts, speed of 140 kilometers (8 miles). Thus to keep up a speed of 200 kilometers (12.5 miles,) an expenditure of 1,100 horsepower would be required.

When the speed was kept between 115 and 118 kilometers (77.15 and 73.5 miles) the consumption of energy amounted to 400 or 450 horsepower; at the feeder point, from 430 to 480 horsepower were then measured; and on the driving wheels, from 374 to 400 horsepower; the steam engines had to develop 479 horsepower. This gives an efficiency of 90 per cent for the motors, of 85 per cent for the electric installation, and of 45 per cent only for the whole plant. We have to bear in mind, however, that the power station was further off than it would be in a special railway plant. It would be futile to base any estimate as to working expenses on these tests.

The air resistance or pressure was determined by fixing water gauges 0.2 inch in diameter, in the front and back and on the sides of the carriages. These gauges were barometer tubes, lead through apertures made in the car walls. The rise in the air pressure did not extend beyond a distance of 3.3 metres (11 ft.) in front of the carriage. The position and shape of the apertures proved of no inuflence. But the rounding off of carriages on the sides and at the roof was found to be a very important feature. The air pressure was found to be $D=0.065a^2$. No particualr increase in the pressure was noticed on the rear portion of the carriage, nor was any noteworthy suction effect observed in the wake of the car.

When the speed exceeded 120 kilometers (75 miles) the signals could no longer be well distinguished, and the rain striking the windows interfered very much with the visibility of the signals. The latter will therefore have to be made very large and clear, and will have to be placed quite a mile in advance of their destination. It is also intended to try signals on board to be actuated from the signal boxes, and to repeat the respective signals by bells along the track.

The experiments, to sum up, do not allow final opinion to be passed upon electric high speed traction. This was not to be expected, however, and the results are on the whole, satisfactory; quite sufficiently so, certainly, to justify a continuation of the work. Meanwhile the permanent way will be improved and heavy rails laid on suitable sleepers placed close to one another.

The heavy expenses of this part of the program will partly be borne by the State Railway Department which will find the necessary material. The experimen

are expensive enough in themselves; but their exceptional interest should encourage the promoters of this remarkable investigation to persevere with them. We have heard of occasional high speed tests, notably from the United States. But such systematic, carefully planned, and conducted work bears a true scientific stamp and reflects much honor to the men who risk their lives in the task.

A DEPARTMENT OF MINES AND MINING.

BY REPRESENTATIVE S. D. WOODS.

THE establishment of a Department of Mines and Mining as one of the general branches of the national government would be logical and sequential and entirely in keeping with the inevitable development of the country. In all that makes for commercial and industrial achievement, the United States is now at the forefront of the nations of the globe but if she is to maintain that position of pre-eminence it must be by intellect not by cannon, and if she is to more strongly entrench herself the task must be performed with heads not with hands. For the fullest realization of the development that is necessary to our well being as a nation it is necessary, I believe, that the efforts of our workers should be aided and directed by three great governmental agencies—Departments of Agricultural Commerce and Manufactures and Mines and Mining.

Moreover there can not be the slighest doubt that the last mentioned is quite as important as either of the other two. Certainly in so far as material import is concerned the mining has risen to the dignity worthy of a department of the federal government. The national mineral output of this country has during the past year reached the billion dollar figure and yet all the leading mining authorities know full well that mining in the United States is in a sense yet in its infancy. The average man who associates a mining department only with the production of precious metals has grasped but a small part of the significance of this wonderful industry. The specified mineral products on the mineral output list of the United States Geological Survey number sixty-two and included in this list are anthracite and bituminous coal, cement, petroleum, fire clay and stone,—products the valuation of which exceeds a third of a billion dollars annually, and yet which I venture to say are never thought of in the category of minerals by a considerable portion of the public.

It is my belief that a Department of Mines and Mining would duplicate the success of the Department of Agriculture in value and benefit conferred, for inevitably the work of the branch of the government devoted to mining will be largely educational just as is that of the Department of Agriculture. Investigation and experiment can be depended upon to disclose improved and cheaper methods of mining and to render possible the successful operation of many properties which are now abandoned because of difficulties of one kind or another. So too a Department of Mines and Mining with its trained experts devoting all the time to the work would be depended upon to find a solution as to methods which would unlock many of the rebellious orés which now baffle mining practice. Finally, the supremely important work of the Geological Survey would be transferred to the new department and the transfer by the Interior department to its jurisdiction the management and disposition of all mining land owned by the government would insure the preservation for the people of valuable rights.

Moreover there is a human side or a sentimental phase it might be called, of this issue, which more directly concerns the great mass of the people. With the development of the mining industry the number of working miners has increased proportionately until today there are hundreds of thousands of men working in mines and mining plants. Indeed, there are now engaged in mining in this country more men than are employed in any other one distinct industry save agriculture. The interests of these men must be safeguarded, not in any half hearted fashion or in an indirect manner through a department in which mining figures only as in incidental interest. How general is the feeling upon this subject is typified by the fact that the demand for the establishment of a Department of Mines and Mining has within the past few

months been endorsed by all the most prominent organizations connected with the industry and including the International Mining Congress held at Boise City, Idaho; the Trans-Mississippi Congress, at Cripple Creek, Colorado; the California Miners' Association, of San Francisco, California; and the United Mine Workers' Convention, at Indianapolis.

Aside from the material and scientific value which is literally inestimable, the Department of Mines and Mining is directly necessary to the welfare of working miners. New and complex problems are arising in the mining industry every day which should, indeed must, be judicially considered by men equipped for that purpose. The Secretary of Mines and Mining must be a man with the quantity and quality of brain and the necessary experience to insure the proper discharge of his very trying duties. No mere socialist can head the Department of Mines and Mining. Every mining man, every mining lawyer, I might almost say every working miner, knows that a man qualified by reason of long experience for Secretary of Commerce would not be fitted for the position of Secretary of a Department of Mines and Mining. This fact simply emphasizes the necessity for a department devoted to the great mining interests.

Finally, the vast mining interests of this country—and by mining interests I mean those of both owners and operatives—need a Department of Mines and Mining to back them up in a demand for the legisation which may from time to time be essential progress and development. Then, too, the acquisition of the Philippines and the rich and extensive discoveries in Alaska with every assurance of still greater discoveries in Alaskan territory, have still further emphasized the necessity for this department. The inauguraton of this new branch of our government—a government which while not maternal is strong in maternal instinct—would prove one of the greatest if not the greatest boon which could be granted to that wonderful land of promise, the Pacific slope, and I am confident that when the great issue comes to be threshed out and the tremendous importance of the mining industry is appreciated, there will be no hesitancy in installing a Department of Mines and Mining as one of the triumvirate of new governmental institutions which will make for a greater America.

Firedamp Explosions.

THE Conferences of Scientific Actuality," given under the auspices of the Natural History Museum of Paris, form an important feature in the scientific life of France. The Grand Amphitheatre of the Jardin des Plantes which is contiguous to the museum serves admirably to unite the world of learning in one common experience. Although M. Milne-Edwards was the official founder of these conference to M. Stanislas Meunier, the distinguished professor of the geological section must be given the credit of having advocated the idea. It is not necessary to trace the admirable work which has been done in this direction since June 1894 when the first conference was given. Let it suffice to point out that the subject now engaging the attention of French scientists is that of firedamp explosions in coal mines. In his conference at the Amphitheatre April 13, Professor Meunier said the recent firedamp explosion at Wigan, Charleroi, Mons, Virginia and in Mexico at once supplied a thesis of scientific actuality. "Such terrible misfortunes moved us profoundly. We rebel against the fatality which seems to attach itself to the miner and we are quite ready to proclaim that many of these accidents might be prevented. It is well to know that according to the most impartial statistics two men out of every hundred suffer from accidents in the mines every year, the number of deaths from the same cause being from three to four per 1,000." The Natural History Museum has on frequent occasions organized "geological excursions" to the pit and in this way Professor Meunier became thoroughly acquainted with the working of the chief coal mines in France. He acknowledes that he found difficulty in obtaining photographs, the mining managers showing no disposition to help him in this way. He warmly acknowledges the assistance he received abroad, especially at the hands of Sir Archibald Geikie of the Geological Survey. and Herbert Hughes of Dudley. Obviously the lecturer did not ignore the other perils of mining life but "firedamp

explosions had a specially tragic character owing to their suddenness and to the great number of victims they generally make in an instant. One of our savants whose studies on coal have made him celebrated, M. C. Grand' Eury, of the institute, professor of the School of Mines, at St. Etienne, hearing that I was about to give this conference, wrote me a letter in which he said: —'This terrible phenomenon is represented as a red flame violently propelled from the point where the firedamp exploded. Woe to the miner who breathes this flame. If he is not killed right off, he will surely die a few days after the accident. The expansion which is produced is soon followed by a second shock due to the vacuum produced by the condensation of the water. It is then that the galleries collapse, completing the horror of the catastrophe. One of the effects of gas explosions in the mines is to blacken and roast the skin of the unfortunate men who are attacked; it peels off easily; it is horrible; nothing can picture the aspect of the victims who are extracted from the black hole. Those who escape immediate death succumb a few days after, if they have, as is said, swallowed the fire. If they have not swallowed it, they have breathed the oxide of carbon which makes them anaemic or weakens them sometimes for the rest of their lives."

Professor Meunier is confident, from the facts of experience, that firedamp may in certain cases be sufficiently abundant to constitute a force capable of utilization, and thus, he says, it may be made by confering benefits to compensate for the evils it conflicts. In his remarks on the origin and the formation of the gas, he spoke as follows:—"Its origin is evidently connected with that of coal itself. Some authors have thought that firedamp was produced at very ancient date, and that it is held prisoner in the pores of the combustible. It only awaits an issue to free itself with a force proportioned to its pressure. That was the opinion of Dufrenoy. Others, however, were of opinion that its formation was continuous, and that point of view seemed more likely, for that made of it a result of the decompostion of plants. Often the plants which have engendered coal are of large diimensions; often also, as M. Bernard Renault has recognized, the vegetation is miscroscopic. That scientist had shown that even coal was full of microbes, a discovery which followed a series of other of capital importance made by M. Bernard, one of our greatest botanists. If these microbes were the artisans of coal, we must also attribute to them the fabrication of the gas which the carbonization liberates. But here it will be necessary not to proceed too quickly. If the gas was formed at the gas epoch, it is difficult to understand how it was conserved in coal which has been submitted to such pressure as frequently to have lost sixteen-seventeenths of its primitive wood volume." Among the firedamp indicators in use, Professor Meunier refers to those of M. Pieler, the Austrian engineer, of M. Chesneau, the French mining engineer, and of M. Coquillon, as highly perfected instruments. In some mines electric light is employed; M. G. Trouve, for example, had invented a portable electric safety lamp for the use of miners. It gave the light of one candle for twelve or thirteen hours, or of four candles for three hours. It is he who made the portable electric torches used in the ballets at the Opera. Professor Meunier has a great admiration of the miner. "Every time I visit the crypts of cvilization, known as the mines, I bear away with me a fresh esteem for those toilers whose characteristic, elevated above all others, is that they have a passion for their calling. This assertion may appear singular, but it is as true in the case of the miner as it is in that of the mariner. Separated from his mine, the coal digger is quite at a loss what to do with himself, and really suffers from a kind of homesickness. No doubt their situation might be improved, but it was far from being so painful as that of the greater portion of the working classes." In conclusion, he said, "Our inquiry has led to another result; the attestation of the incessant activity which reigns in the depth below the earth's surface. The comparison between the condition of subterranean regions and the regime of living animal and vegetable organisms is forced upon us. Also the notion arises of a true tellurgic physiology realized by the collaboration of vegetable apparatus (appareils). Understood in this sense, geology occupies quite another position to that generally attributed it to; it becomes as living and as palpitating as hitherto it has been judged cold and immovable." Professor Meunier proposes to continue the subject in future conferences.

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EDITORIAL COMMENT.

The New Government Department—The language of Representative Woods on the proposed Department of Mines and Mining lacks the force necessary to convince even those who might naturally be expected to favor such an addition to governmental bureaus. It has too much of the political ring and rather too little of the commerical tone to be classed as a telling effort for the creation of the new department. The magnitude of the mining industry standing alone, either as to the amount of capital involved or the number of workers engaged, is not a reason for the establishment of another governmental department. That is, speaking from the business side of the case, for if that is admitted then other industries equally important or more so, would seem to demand the creation of a department having for its object the care-taking of its interests.

Following such a proposition it might be expected that the men engaged in the mining industry would favor the creation of such a department if its end promised material benefits, and beneficial results must at least be anticipated as a foundation for the bare proposal.

The fact is that the men engaged in the mining industry are either indifferent to the plan or oppose it. The operators have not acted with unanimity one way or another, while the miners who must be granted consideration, are either silent or actively hostile. While this state of mind exists spectators on the outside must be accorded the liberty of expressing doubts on the desirability of the proposed department.

The Strike a Fact—After weeks of doubt and hesitation from a variety of causes the strike of the coal miners of the anthracite regions has begun. Influential men in business and public life offered their offices to prevent a strike either through direct persuasion or as mediators. Just what was offered and rejected has not been made clear but there is no difficulty in understanding the melancholy fact that the miners will be ground into dust between their leaders and their employers. While the officer of the United Mine Workers and the operators of the anthracite mines skilfully skirmish and maneuver to maintain their positions, or move about to take up new ones more advantageous than the old, the miners must remain simple spectators. Their real interests are ignored in the diplomatic shuffle of operators and leaders.

The strike of the anthracite miners is the first actual disturbance in the industrial situation of the year but the moral effect may extend into other occupations. How far the strike will affect the coal interests can be a matter for conjecture only at this stage of the scheme, for if there is one thing more certain than all others it is that the officers of the United Mine Workers who stand committed to the movement of violence must keep on to the end. The end can hardly be favorable to the miners although in the language of the miners' officers it may be a technical victory. Materially, and in the loss of the creature comforts which the men must sacrifice and for which any slight gain they may make will not compensate, the men must be losers.

Proposed British Flange Standards—The article published in this issue dealing with the existing practices and suggestions favoring the adoption of a new standard for pipe flanges and flange fittings, will no doubt form interesting reading in view of the growing international trade and the promise of its extension in the immediate future. The shipments of American pipes to all parts of the commercial world lends an additional interest to the proposition to establish a standard that will operate for all European countries especially where the American products are in direct competition with the foreign materials in finished form. The proposed British standard takes note of the American practice and standards as will be noticed and contemplates an harmonious union with them.

PERSONAL MENTION.

Jospeh A. McDonald has been appointed assistant superintendent of the Ohio plant of the National Steel Company, at Youngstown. This is a new position just created. Mr. McDonald was superintendent of the converting and the rolling mill. Louis McDonald has been appointed superintendent of the converting and rolling mill to succeed Jospeh McDonald. Louis McDonald recently went to Youngstown from the Pittsburg district.

Edward C. De Wolfe, late in charge of the draughting room of the Dodge Manufacturing Company, of Mishawaka, Ind., and a frequent contributor to the columns of various mechanical journals, has accepted a position as associate editor of "Steam Engineering," which has lately removed from New York to Chicago. He takes up his new duties at once.

Joseph Rayser, formerly of the Haselton furnace of the Republic Iron & Steel Company, has been appointed assistant superintendent of the Mary stack of the Ohio Iron & Steel Company, of Lowellville. He takes the place of Fred McCombs who was killed last week.

E. B. Clarke, superintendent of the Pittsburg Locomotive Works, has gone to Paterson, N. J., to take charge of the Rogers' works. He will be succeeded at Pittsburg by J. R. Howgate, formerly with the Schenectady plant.

William Wilson has been appointed assistant to vice-president and general manager, Charles McCreery, of the Tennessee Coal, Iron & Railroad Company.

J. S. Colyar has b u appointed furnace manager for the Sloss-Sheffield Steel & Iron Company, at Sheffield, Ala.

OBITUARY.

THOMAS R. HAMMOND—Thomas Roberts Hammond, of the Reese-Hammond Fire Brick Company, Bolivar, Pa., died Saturday last at Aiken, S. C., where he had gone hoping to benefit his health. He was 49 years of age and is survived by his wife and five children.

The Tidewater Report.

The Tidewater Steel Company held its adjourned annual meeting at Philadelphia April 3, as well as a special meeting, at which it was voted to increase the present capital stock of the company by an issue of $600,000 of cumulative preferred stock. The following directors were elected: Evans R. Dick, George S. Graham, George McCall, Charles A. Porter, R. H. Rushton, Charles T. Schoen, A. S. L. Shields, C. E. Stafford and F. W. Wood. President Stafford made an exhaustive report of the condition of the plant, in which he said in part:

"We began making money last September, and have been making money ever since that time. We have run as high as $20,000 per month, but our profits have been absorbed in necessary changes and in additions to the plant, which will add greatly to its effectiveness and earning capacity in the future. The year 1901 shows gratifying increases. Pig iron shipments have increased over 250 per cent., plate shipments over 120 per cent., plate scrap shipments over 20 per cent and open-hearth steel production over 275 per cent.

"The issue of preferred stock will enable us to supply ingots for the large plate mill and put the blooming mill in condition to roll slabs for the smaller plate mill, and the production of our blast furnace will be nearly double. The arrangements are about completed for the erection of by-product coke ovens, which will mean a saving to the company of $75,000 er year, or more than enough to pay interest on the new preferred stock."

The entire issue of new stock has been underwritten by Philadelphia and New York capitalists, who will take whatever is not taken by the shareholders. The purposes for which the new capital is to be used are as follows: Open hearth, two additional furnaces, $150,000; improvements to blooming mill, $50,000; blast furnace equipment, $100,000; additional work, capital, etc. $300,000.

The stockholders also voted to amend the charter to make the corporate headquarters of the company at Chester, instead of Philadelphia.

The Merger Accomplished—J. W. Duntley, president of the Chicago Pneumatic Tool Company, and E. N. Hurley, ex-president of the defunct Standard company, which the former company absorbed have, returned to the United States from London after a successful sojourn in London consolidating business interests.

Their object was practically effected by the purchase of the International Pneumatic Tool Company, which controlled the trade in England. The purchase gives the American company a monopoly of the industry in Europe. J. P. Morgan. according to Mr. Duntley, is interested heavily in the deal through Mr. Schwab, president of the United States Steel Corporation, though it is a small affair to him.

IN AND ABOUT PITTSBURG.

The Baltimore & Ohio Railroad Company has sent out plans and specifications for the proposed new car shops at Connellsville. All of the buildings will be of brick and will consist of a round house, machine shops, blacksmith shop, boiler and engine room, store and oil house, carpenter shop, trainmen's house, turn table, sand house and a number of small buildings. The machine shop building will house the machine shops proper the blacksmith shops, and boiler and engine room. The machine shop proper will be 100x70 feet, the blacksmith shop 45x58 feet, the engine room 20x49 feet. The store and oil rooms will be in a building 30 x 65 feet.

The Hartman Manufacturing Company's plant at New Castle, as well as all the other interests of that company' was sold last week. There were few bidders and all the properties were bought by Attorney Igoe who represented Charles M. Ward, of New York city. The New Castle plant was sold for $160,000, while the Ellwood property of the defunct company was sold for $3,000 All the interest of the Hartman Company in the Cuyahoga Steel & Wire Company, of Cuyahoga Falls, O., was sold for $75,000.

The Homestead Valve Company has bought 100x200 feet of land adjoining its plant at Homestead, and is completing plans for the erection of a brass foundry, which will eventually be enlarged for an iron casting department. The company recently removed its plant from Pittsburg to Homestead and enlarged its finishing department. Business is reported to be in excellent shape and a new valve will shortly be placed on the market.

Frederick J. Newman, consulting engineer and automobile expert, has opened an office at 504 Lewis building this city. In connection with his practice as a mechanical and electrical engineer, Mr. Newman has for the past four years been associated with the Woods Motor Vehicle Company, and the Westinghouse Electric Company in designing and superintending the construction of electric and gasoline vehicles.

The National Gear Wheel & Foundry Company, Allegheny. is having patterns made for larger sizes of the Mertes gas engine than heretofore made. It is the intention of the company to build engines up to 150 horse power. In order take up this work the company will install a number of new machine tools which are still to be purchased.

The Eleanor Coal & Coke Company, of Union town, has been incorporated with $90,000 capital, succeeding the Ada Coal & Coke Company, whose plant at Cheat Haven was recently bought for $40,000. The increased capital is to enable the new owners to absorb more coal and enlarge their oven capacity. A.W. Bliss and J.D. Boyd, of Uniontown, are largely interested.

The Central Iron Company, recently organized, has retained Walter Kennedy, the well-known engineer of this city, to design and construct a blast furnace at Tuscaloosa, Alabama. Mr. Kennedy returned this week to Pittsburg from a trip through the South and while away arranged to rebuild two furnaces for the Woodward Iron Company, Woodward, Ala., one for the Albama Consolidated Coal & Iron Company, Gasden, Ala., and to build a new furnace in Tennessee. The furnaces will be equipped with the "Kennedy" skip filler.

Application will be made May 9 for incorporating the Brush & Stephens Company, the parties interested being George E. Brush, John S. Stephens, Ernest H. Kramer and Thomas H. Stephens. The new company will take over the business of Brush & Stephens, pattern makers, of this city.

The Carnegie Sheet Steel Company, Carnegie, will place contracts for most of its equipment this week. The plant will contain six sheet mills, two 25 ton open hearth furnaces, etc. Bids are being received for the erection of the building, mills, furnaces, three traveling cranes, power plant, etc.

The Pittsburg Clay Pot Company, of Allegheny, has secured 1,000 acres of fire clay beds in Kentucky. The company is arranging to build an exension to its plant in Allegheny. A site for the additional works will be selected after the annual meeting of the stockholders in July.

Application will be made June 2 next by Benjamin F.' Jones, Jr., Willis L. King, William Larimer Jones. James B. Laughlins and Irwin B. Laughlins for a charter of an intended corporation to be known as the Jones & Laughlins Stee Company.

The Trott-Martin Company, consulting engineers, has been organized by D. C. Trott and S. B. Martin of this city. The company has taken over the business of D. C. Trott & Com pany and will make a specialty of plants for economy.

The Pittsburg Gage & Supply Company, this city, has been appointed direct representative of the Weller Manufacturing Company, Chicago, for its line of elevating, conveying and power transmitting machinery.

Hussey, Binns & Company, this city, have been changed from a limited partnership to a corporate body. The company has been granted a charter under the name of the Hussey-Binns Shovel Company with an authorized capital of $2,500,000, of which $1,000,000 is paid in. A meeting was held in the offices of the company, in the Bank of Commerce building, last week and a permanent organization erected. R. H. Binns, formerly chairman of the company, is president; E. B. Alsop, vice-president; George V. Wilson, secretary and treasurer: and F. B. Newton, superintendent of the works. The company's plant is located at Charleroi.

The Columbia Iron & Steel Foundry Company, which is operating a plant at Thirty-fourth street and A. V. R. R., is looking for a site in the Pittsburg district where five acres of ground can be secured and with better shipping facilities than it now possesses. The present quarters are too small to properly handle its business. Wherever the company locates it will erect a building about 150x250 feet for the manufacture of open hearth steel castings.

Bids are being received for the erection of the new plant of the H. Adler Manufacturing Company to be located at Carnegie. Mention has already been made in these columns concerning the size of the different departments.

It is understood that the Graselli Chemical Company, of Cleveland, is negotiating for the new plant of the Sharon Chemical Company, at Sharon, which has made application to have the dissolution of the firm granted.

The McClintic-Marshall Construction Company, of this city, has been awarded the remainder of the contracts for structural steel work on the new shops at McKees Rocks by the Pittsburg & Lake Erie road. These include the frame work for a power house, boiler shop, storeroom and a blacksmith shop, amounting to $60,000.

Carl R. Daellenbach, Frank B. Hinkson, Joseph M. Flannery, John D. Stahl and others, will make application for a charter for the Daellenbach Gas Engine Company, of this city.

An application for a charter will be made May 29 by the Domestic Coal Company to mine coal and manufacture coke. The incorporators are Samuel A. Taylor, H. S. Harrop and N. F. Hopkins.

The Liggett Spring & Axle Company, Beaver avenue and Fayette street, Allegheny, has increased its capital stock to $300,000. The company is preparing plans for a large extension to its plant.

The Morrison & Cass Paper Company, Tyrone, Pa., has placed an order with the Link-Belt Engineering Company, of Philadelphia, for a large coal handling plant to be installed in its boiler house.

The $10,000 bonus for the Sligo Iron Works, of Pittsburg, to remove to West Newton, has been raised, and it is believed the industry will locate in that place.

The Pittsburg office of the Dearborn Drug & Chemical Works, A. W. Crouch, manager, has been removed to room 206 House building, this city.

NOTES OF THE INDUSTRIES.

The new blast furnace of the Cleveland Furnace Company, at Cleveland, O., will be located on ground recently bought along the Cuyahoga river just above Clark avenue. The river is not navigable to that point, at least for large ore boats. An arrangement has been made, however, with the Wheeling & Lake Erie Railroad by which the new furnace will handle its ore over the old Connotton dock, and will also handle merchant ore in the same manner. The dock has practically, therefore, been taken over by the Cleveland Furnace Company. This lease runs for 20 years with, however, the privilege of relinquishing it at any time that the furnace is able to obtain its own dock. This will depend upon the improvement of the river. It is proposed to agitate the question of dredging the river up to the furnace and thus add to its navigable length. The first contracts have been let, that for the blowing machinery, by far the most intricate part of it. This contract goes to the Mesta Machine Company, of Pittsburg.

The steel structural work for the new factory of the Brown Hoisting Machinery Company, Inc., at the corner of Hamilton and Belden streets, Cleveland, O., is being put in place rapidly. The foundation dimensions of this shop are 500x312 feet, and the enclosed space will be all in one room. The entire shop is composed of seven bays, each equipped with mammoth traveling cranes. The wings on either side are to have saw tooth roofs, with light gables facing the North. The three main bays are very high, the center one being 84 feet clear, from the ground, so arranged for erecting machinery. The entire building is constructed of iron, steel, glass, and cement, making it as fire-proof as possible. The floor space of the new shop is double that of the old

are to be constructed of a new sheet steel, dovetailed, which was invented for the purpose by Alexander E. Brown, vice president and general manager of the company. The entire building will be lighted by electricity, and heated and ventilated by force blast.

Judge Thompson in the United States Court, Cincinnat, O., has decided the case of the Etna Iron & Steel Company against the Marting Iron & Steel Company, Ironton, O., in favor of the defendant. The case involved several important claims on the property operated by the defendant company. The property, because of the present iron and steel boom, has increased immensely in value, as compared with what it was when litigation was begun by the plaintiff with its former owners. Judge Thompson held that the plaintiff could not take advantage of this turn in fortune, and dismissed the claim for want of equity.

Announcement comes from Chicago of the federation of a $40,000,000 steel foundry combine to be known as the American Steel Foundrys Company made there May 10. Arthur Eddy, a Chicago attorney, was the organizer, and the underwriters are Harris, Gates & Company, of Chicago. The concerns embraced in the organization are: Sargent & Company of Chicago the American Castings Company and Leighton & Howard, of St. Louis; the Franklin and Reliance companies, of Pennsylvania, and the American Castings Company, of New Jersey. The persons interested are: Judge E. H. Gary, C. A. Schwab, John W. Gates, J. F. Harris and others.

The Canton Bridge Company, Canton, O., has completed plans for an extension to its plant which will double the present output, and bids for equipment will be invited within the next ten days. The company recently bought three acres of ground adjoining its plant, which gives 10 acres in all. The plans provide for a 50 foot extension to the main building, a straightening shed, bar stock house, machine shop, 40x96 feet, forge shop 70x80 and templet shop 40x70 feet. Traveling and jib cranes will be installed.

The directors of the newly organized Cleveland Furnace Company elected at the meeting held in New York City last week are: Archer Brown, New York: D. B. Meacham, Cincinnati; William G. Park, New York, and S. W. Croxton. Cleveland. Mr. Meacham of Rogers, Brown & Company was elected president and David T. Croxton, general manager. C. B. Smith was elected secretary and treasurer. The capital stock of the company will be all common, and there will be no bond issue.

The contract has been let by the Pennsylvania Company for a new roundhouse at Columbus, O., to Charles J. Close, of Buffalo, N. Y. Thomas Rodd, chief engineer of the Pennslyvania is in charge of the improvements to be made at these shops. The new roundhouse will have 44 stalls and will cost $125,000. It will be one of the most complete in the country. The structure will be of red brick with steel trussed roof and will be equipped with all modern conveniences for the handling of locomotives.

The new tube works of the Wheeling Steel & Iron Company, Wheeling W. Va., will not be begun before July. Considerable delay is experienced in obtaining the rolling and welding machinery The threading and cutting machines are all in place. The electric power house is almost completed and is said to be one of the best equipped in the country.

The American Iron & Steel Manufacturing Company, of Lebanon, Pa., gave a reply to the request of 1,500 employes of the bolt and nut departments of the Reading plant for an increase in wages. The reply states that the management does not feel justified in making the advance at present. The company has a strike in its plants in Lebanon, where 2,000 men are out.

The Bradford Gas Engine Company, Bradford, Pa., and the Flickinger Company of Cochranton. Pa., have been consolidated and will hereafter be known as the Flickinger Iron Works, Incorporated, with a capital stock of $50,000. The plant at Cochranton will be abandoned and in the future all of the work of the company will be done in Bradford. The buildings will be enlarged and the present output doubled.

A syndicate of outside capitalists through the efforts of prominent Newark, O., citizens, has secured an option on a large tract of ground for the purpose of building a rolling mill which will roll sheets and tin plate. In addition they will erect a large galvanizing works equipped with the new process. The tin plate department will also be equipped with the latest and most improved machinery.

The State Convict Bureau has peremptorily ordered the removal of the state convicts from the Coalburg mines of the Sloss-Sheffield Steel & Iron Company on account of the unsanitary condition of the mines there. The convicts will be removed to the Flat Top mines of the company now preparing for the convicts.

The Southern Sewer Pipe Company has fixed North Birmingham as its location and will erect its plant there. S. L. Russell is president and general manager; C. S. Bissel. vice-pesident and business manger J.A. Menge, secretary and treasurer.

The Cuyahoga Wire & Fence Company, Cuyahoga Falls, O., capital stock $1,000,000, absorbs

the Cuyahoga Steel & Wire Company of that place and the Hartman Manufacturing Company of New Castle, Pa. The main offices will be at Cuyahoga Falls.

The Crescent Snipyard Company, Elizabeth, N. J., of which Lewis Nixon is the founder, has filed articles of incorporation. The company is capitalized at $1,200,000, the incorporators being Lewis Nixon, Judge Patrick H. Gilhooly, of Elizabeth, and Mason S. Chace. It is currently reported that the Nixon plant will shortly absorb the extensive Crescent Iron Works, owned by the Samuel L. Moore & Sons Company, which is opposite the shipyard.

The Sloss-Sheffield Steel & Iron Company recently brought back fromRotterdam, Holland, a lot of pig iron shipped there several months ago and, paying the duty both ways, sold and delivered it to parties in Baltimore at a profit. The iron went originally from the Birmingham furnaces.

It is the intention of the Youngstown Manufacturing Company, Youngstown, O., to add to its Struthers plant a puddle mill and rod mill. The plant produces nuts and bolts and the new mills will supply the nut and bolt department with its own raw material, from the puddle mill through the rod mill to the finishing department. Bar mill rolls will also be supplied so the plant can produce bar iron by a change of rolls. The work of building the new departments will be begun immediately.

Ten of the 30 mills of the Shenango plant of the American Tin Plate Company, New Castle, resumed operations Monday this week, having been idle since the plant was partially wrecked by the high wind last week. It is not yet known when the other 20 mills will resume.

The Western Steel Car & Foundry Company, capital $1,250,000 has been incorporated to manufacture cars and do a general foundry business. The incorporators are J. A. Willamson, Davis D. Woodruff, William B. Denton, all of Jersey City, N. J.

The Osborn Engineering Company, Cleveland, O., has obtained the contract for the preparation of the plans and specifications for the new $150,000 plant of the Cookshutt Plow Company, limited. Brantfort, Ont.,

Denny & Welsh, builders, Philadelphia, have posted plans for a brass foundry to be built on the East side of Twelfth street, near Washington avenue. It will be two stories high, of brick, 21x70 feet, with a wing 18x30 feet.

An order for five large blowing engines has been given to the Allis-Chalmers Company, Milwaukee, Wis, by the United States Steel Corporation for use in the Carnegie plants.

The American Soil Pipe & Foundry Company has been incorporated by W. J. Long, H. C Mead and T. Y. Huffman, all of Bessemer, Ala., capital stock $100,000. They will erect a soil pipe factory at Bessemer.

The annual meeting of the stockholders of the Gloucester, N. Y., iron works will be held this week, and it is said that some disposition may be made of the old dismantled plant in Gloucester.

The laborers at the Penn Iron Works, Lancaster, Pa., 60 in number, have struck for a 10 per cent, increase in wages. They were receiving $1.15 per day.

The Maryland Sheet & Steel Company, Cumberland, Md., is completing its new rail mill and will be ready to roll light rails within a week.

The Gilreath Mining & Manufacturing Company has bought the Hoene mines property from Ignatius Pollack and I. Ruman, of Montgomery, Ala., the price paid being $35,000.

The Oster Manufacturing Company, Cleveland, O., will soon begin the erection of a new factory building on Schley street, near East Prospect street. The building will cost $8,000.

Messrs. Charles and Henry Vogelmeier, Newark, O., will build a brick and tile plant at that place, the plant to be 75x100 feet and cost to $20,000.

Because the firm would not discharge some girl coremakers, 60 boys at the Stanly G. Flagg & Company's foundry plant, Pottstown, went on strike.

The Williamsport, Pa., board of trade has closed negotiations for the location of the Steel & Robinson iron works in that city.

Ground has been broken by the Youngstown Iron Sheet & Tube Company, Youngstown, O., for the erection of the new skelp mill.

The new building recently constructed by the Powers Foundry Company, at Elkton, Md., will be ready for occupancy this week.

The new structural works of L. F. Shoemaker & Company, at Pottstown, Pa., will be put into operation this week.

W. L. Mosser & Company, Richwood, W. Va., will erect a large tannery at that place in the near future.

The Wheeling Roofing & Cornice Company has begun work on what will be a large plant near New Martinsville. The company purposes the construction of a sheet and rolling mill and blast furnace later. Besides this a large corrugating mill has been put under

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The market is making gains in both direction—the producers are making headway against the accumulation of delayed contracts and the consumers continue to send in their orders for the later months of the year and the early weeks of 1903. The tonnage that is available for delivery during the final quarter of this year is fast going and it is generally expected that before the second quarter has ended the capacity of the blast furnaces and those steel plants that have not covered their production fully will have disposed of all the product which may reasonably be expected to be turned out. The postponement of the strike of the blast furnace hands has had the effect of restoring the relatively easy state of mind of the blast furnace operators and larger consumers of pig iron, as it seems to indicate that the issue is susceptible of adjustment without resorting to strikes.

What little uneasiness is felt now is solely among the smaller consumers who appear to have a experienced a fresh attack of fright lest they be caught without raw material during the second half of the year and during the opening weeks of 1903. The larger consumers seem to have become reconciled to the situation and are not afraid that the material will be short again this year as has been the case since the heavy buying began in the early spring.

Premiums continue to be paid for all classes of material, raw and finished for preference as to deliveries but the run of shipments is not frequently broken into for bonuses. The larger contracts are being filled first to the exclusion of other tonnages regardless of premiums. There is no material available now for spot shipment and little can be had for delivery inside of 60 days.

The ruling quotation on Bessemer pig for delivery in 60 days is $21 at valley furnace with even higher figures promised for later in the year. The rumors of higher prices in the finished lines have not materialized up to date but there can be little doubt that a higher level will be reached before the end of the second quarter. While only one or two finished steel products have been named it is probable that there will be a general advance.

CURRENT QUOTATIONS:

Basic	$20 25		Splice bars	1 50	
Bessemer		20 75	Angles	1 60	
Charcoal, hot	32 00		I beams	1 60	
Charcoal, cold	32 50		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 70
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	34 00		No. 1 cast	17 00	17 50
Open hearth	35 00		Iron rails	25 00	26 00

Steel bars	1 50		Car wheels	18 00	19 00
Iron bars, refined		2 00	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—The general situation is devoid of specially interesting or significant feaures for the week. Generally speaking, there is a limited volume of business doing in the cruder forms of production, but the conclusion is warranted that it is the meager supply of materials, rather than a lack of new requirements among buyers, that is responsible for this condition. Consumers are paying steadily advancing prices for May and summer deliveries, and the scarcity of iron for fall and December shipment on new orders is quite as, if not more, pronounced than ever. In domestic steel there is not much doing, but a good deal of foreign is being offered on the market, both in billets and sheet bars. In finished iron and steel the only noteworthy development has been in respect of the demand for plates both East and West, which has covered mill capacity during the past few weeks for many months. In the same time the structural mills have so added to their holdings that several of them are now substantially sold up to the end of the year.

The strike among the puddlers in the Lower Susquehanna Valley many develop some scarcity in bars, skelp and other rolled products in the Eastern section of the country.

There has been very little business in the local pig iron market during the week, simply because every ton of iron that can be made for months to come is practically engaged. In the mean. time there is fairly good volume of inquiries, and for prompt and near-by shipments consumers whose necessities are pressing are willing to pay almost any prices asked. The following figures about represent this market for deliveries running from July to December: No. 1 foundry, $20.50 to $21.50; No. 2 foundry, $19.75 to $20.50; gray forge, $18.25 to $18.50.

Domestic steel billets continue very scarce. Some foreign material is reported as coming in on old contracts, but new lots are not available.

There is little or no change in manufactured iron and steel products. The demand is active and prices all along the line are firm but unchanged. The plate mills are at present somewhat overcrowded. Structural material is very strong and urgent requirements are known to exist, but they are not being forced into the market because of the known inability of manufacturers to do anything for the accommodation

of customers. The demand for sheets has fallen a great deal as compared with the early part of the year. The trouble among the puddlers in Central Pennsylvania may cause a considerable shortage in bars.

Three has been some inquiry for steel rails for next year's shipment, but no actual tonnage has yet been placed. It is officially stated that there will be no advance in prices.

CURRENT QUOTATIONS:

Foundry, 1	$20 50	21 50	Girder rails	32 00	32 50
Foundry, 2	19 75	20 50	Angles, 3" & lr'gr		1 80
Gray Forge	18 25	18 50	Under 3-inch		1 90
Bessemer billets		33 50	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown & Company—A fact in the iron situation that deserves noting is the disappearance of the skeptic. He was largely in evidence earlier in the year both among consumers and producers. The "crest of the wave" was a common expression. Now that we are on a still higher crest the talk is generally of settled conditions and a clear horizon. Certain it is that the fresh current demand in both raw and finished forms is fully equal to current production, leaving undiminished the mass of orders which manufacturers have on their books and on which most are delinquent.

How much pending labor troubles will disturb the situation, no one can tell. The demand of Western furnacemen for an eight hour instead of a twelve hour shift, without change of wages, would, if conceded, add fifty per cent to labor cost. But more important still, it would create an immediate shortage of one-third of the skilled labor needed, which shortage could not be supplied.

Any severe labor contest that would curtail the supply of raw materials at this time would have a damaging effect upon the whole fabric of national prosperity. It is so much to be deplored from the standpoint of both the employer and employed that the public assumes that neither side will permit controversies to go too far.

This assumes wise leadership on both sides which unfortunately, does not always show itself. We pointed out some weeks ago that the relief from excess demand must be found for the present in importations. These have been going on steadily in various forms. While the movement is not sensational, it is of steadily increasing volume. The tonnage, however, runs to steel billets, bars and structural material, more than to pig iron.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$20 50	21 50	Angles	2 00	2 50
No. 2X fdy Jersey City	19 65	20 00	Tees	2 00	2 50
No. 2 plain Jer. C.	18 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	21 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	20 00		Com. base, bars per 100 lbs.	1 65	1 70
No. 3 fdy N. Y.	19 50		Refined base, bars	1 85	1 90
No. 1 soft	16 75		Bands, base	2 40	2 50
No. 2 soft	17 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to 70 & 10		Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

Chicago—Southern pig iron producers have not been selling iron during the past few weeks in this market though customers have been informed that a little iron may be offered soon. There is a keen demand for it. Neither is there any considerable amount of Northern iron available for needs here. The market is almost bare and with a continued though not very large inquiry, prices continue to ascend. The level is perhaps a dollar above that of a week ago. Inquiry is increasing also for shipments during the last half of the year, the tonnages asked for being the heavier near the end of the year. Producers are slow to respond to these calls but some little business has been placed.

Billets can be bought only in limited amounts and at advanced prices, open hearth selling in small lots as high as $40. Steel scrap is also wanted with greater insistence, and values are rising. For finished iron and steel there is no weakness anywhere and some products are higher from store. Bars continue to sell well and plates are called for beyond the capabilities of the market to respond. Structural material is not abating its high prices and trading is necessarily limited. Sheets are in moderate demand, with steady quotations.

Quite an inquiry for standard steel rails or next year's needs is reported in this market. Heavy wants are anticipated. Light rails have advanced. All kinds of old material is in good request. Prices are rather feverish and irregular.

CURRENT QUOTATIONS:

Bessemer	22 00	23 00	Sheets, 26 store	3 25	3 40
Fdry Nohn 1	21 50	22 50	No. 27	3 35	3 50
Northern 2	21 00	22 00	No. 28	3 45	3 60
Northern 3	20 50	21 50	Angles	1 75	
Southern 1	20 65	21 65	Beams	1 75	
Southern 2	20 15	21 15	Tees	1 80	
Southern 3	19 65	20 65	Zees	1 75	
Forge	19 15	20 15	Channels	1 75	
Charcoal	22 00	23 00	Steel melt'g scrap	17 50	18 00
Billets, Bessemer	33 00	35 00	No. 1 r.r. wrought	21 00	22 00
Bars, iron	1 85	1 95	No. 1 cast, net ton	16 00	17 00
Bars, steel	1 75	1 85	Iron rails	24 00	25 00
Rails, standard	28 00		Car wheels	19 00	20 00
Rails, light	34 00	40 00	Cast borings	8 50	9 00
Plates, boiler	1 90	2 00	Turnings	13 50	14 00
Tank	1 75	1 80			

Cincinnati—It is generally expected that inside of the next few days some of the large Southern iron producers will be offering iron again after having withdrawn from the market for two months. If they sell again the price will be $15 for No. 2 at Birmingham. The greatest interest the past few weeks has been to figure the outcome of the attempt of these three large Southern producers to keep the price of iron at $12 for No. 2 Birmingham. An agreement was entered into by these three concerns, effective March 1 to May 1, that they would not sell at a higher price than $12. At present, however, it is understood that the Virginia Iron & Coal Company, and the Sloss-Sheffield Iron & Stee Company have decided to enter the market again because they have not sold as much iron for the year as the Tennessee Coal, Iron & Railway Compnay. There were a large number of 100 ton lots of pig iron sold last week, which made a good sum total, but no large sales are being made.

Structural business will continue good up to the middle of next year.

Agricultural implement manufacturers have placed orders up to July 1903.

The great scarcity of scrap is influencing the price of iron bars, and open hearth product. The heavy purchases of old material during the past two months seems to have taken out of this territory a large tonnage of scrap which otherwise would have been consumed here. Prices of old material are uncertain, but the uncertainty is usually the extent to which values have advanced. There are some factors who think the top has been reached. Supply is no better.

CURRENT QUOTATIONS:

South. fdy. 1	18 25	$18 50	Standard Sections	29 90	30 90
South fdy. 2	17 75	18 2[illegible]	Sheet, 26	3 40	
South. fdy. 3	17 25	17 75	Sheets, 27	3 50	
South. fdy. 4	16 75	17 25	Sheets, 28	3 60	
Grey forge	16 75	17 25	Angles, 3 to 6 in	1 70	
Mottled	16 75	17 25	Angles, 1¼ to 2½	1 82	
Shn. 1, soft	18 25	18 50	Beams and Chanl 15 in and under	1 70	
Shn 2, soft	17 75	18 25	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	22 00	22 50	Tees	1 75	
L. Superior, 2	21 00	21 50	Z's	1 70	
L. Sup'r char'l c w	22 00	23 00	1 wrought scrap	19 00	20 00
Hang'g r'k ccl, 1	26 00	28 00	Steel mlting stock gross ton	16 00	
Sou n ccl c w	20 35	20 60	No. 1 cast	18 00	
Jaksn cy. silv'y 1	21 50	22 00	Old iron rails g t'n	22 00	
St'l bra base hlf ex	1 72		Old car wheels	20 00	
Iron bars	1 82		Cast borings	6 50	9 00
Flange plates	1 80		Turnings	12 00	
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

Birmingham—There is no standard of price in the Southern iron market, whatever to the contrary may be said by those who are desirous of keeping the true situation in the background. For instance, one foundry paid last week for 1,000 tons of No. 2 foundry for delivery this fall $16.50 per ton and it is understood that even higher prices than that have been obtained. This sale was made by a small furnace, the iron being the last it had on hand. It is report that one large iron operator has begun to manifest a disposition to get away from the $12 basis for No. 2 and it is further reported that this attitude has caused a stir among the other large producers in the South. The larger concerns are out of the market for some time to come, but the tendency toward higher prices on sales for next year will have its effect.

There is serious apprehension that there will be a break in the agreement to keep down the market and that prices are going to soar in the near future. The foundries expect and are buying wherever they can on a $16.00 to $16.50 basis for No. 2. Shipments are very heavy both of pig iron and machinery.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$12 50	13 50	Tank	1 80	
No. 2 fdy, Sohn	12 00	12 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	11 50	12 00	No. 1 wrought	14 00	
Grey forge, Sohn	11 00	11 50	No. 1 cast	12 00	
Billets	23 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	310	3 50
Fire box	2 00				

Coal.

Pittsburg—The shortage of cars remains the central point of interest in the coal trade. The movement of ore and other materials has been benefited but it has been at the expense of the coal shipments to the lakes. The local shipments are better, as strong in fact as need be, but the anticipations of extraordinary movement of coal to the lake points will require withdrawal for revision. Shipments can hardly be up to expectations unless the railroads provide a much improved equipment.

Cleveland—With the coal coming forward a little more freely, with an increase in the demand for grain tonnage, and with no letting up in the demand for ore vessels, the shippers have started in to try to break the coal rates to the head of the lakes, after having paid the opening rates without contention throughout the season of depression. The shippers have held meetings during the past week, at which the rate situation has been discussed, and, it is understood, have come to an understanding that nothing better than 30 cents is to be paid to the head of the lakes hereafter. However, previous and pending actions may be harmonized by the statement that heretofore there has not been enough coal coming in to warrant any contest on the wild rates, and not enough charters made to make it worth while to enter a contest with the vessel owners. Even now it is said upon authority that the future of the Duluth rates will depend entirely upon the receipts of coal the first of next week. Nothing has been done this week at a reduced rate. If the coal comes

in in sufficient quantities to permit the shippers to make contest there is likely to be one. The owners have not made known their attitude toward the proposed united action of the shippers, other than to say in a general way that they are opposed to a reduction, which statement might have been expected.

Chicago—The North and South lines through Indiana and Illinois have made a reduction in their freight rates of about ten cents per ton to Chicago. Open tariffs are thus establisheed for coal from all important producing districts, the Eastern roads having modified their rates some weeks ago. There is quite an inquiry for Western coal on annual contracts but the buyers are slow to close. Lake coals are holding firmly at the new prices, which fact is stimulating to some degree the inquiry for the more Western fuels. The tendency of prices is heavy for Indiana and Illinois products, whereas Eastern coals are generally firm. Buyers of coke are wondering if there is to be a reduction in the freight rates on that product. None have yet been announced, though on all kinds of bituminous coal there have been concessions.

Cincinnati—There is a scarcity of coal in the Cincinnati market, due to the fact that stocks of river coal are lower than they have been in a long time. There is no danger of a famine but there is a serious shortage. Prices remain about the same and it is not likely that there will be any change. There is a prospect of a coal freight rate war between the B. & O. and C. & O. railways.

Bought We Fu Go Company.

The water softening and purifying business of the We Fu Go Company, Cincinnati, O., with all its patents, capital stock and good will, has been purchased by the William B. Scaife & Sons Company, this city.

That steam users at last fully realize the vast saving of fuel and labor, and the increased durability of their boilers, and prevention of disastrous explosions when the scale-forming and corroding ingredients are properly removed before entering the boilers, is certainly evidenced by the fact that Wililam B. Scaife & Sons Company, advise us that their softening and purifying plants in the United States alone are daily treating over 14,000,000 gallons of water.

The numerous plants which the Scaife Company has installed are in all kinds of steel factories, ice plants, bleacheries, malt houses, textile works, hotels, office buildings, laundries, etc., including also almost every concievable industrial and domestic purpose.

Coke.

A summary of the Connellsville region for the week shows 20,578 ovens in blast and 708 idle.

The following figures show the scope of operations.

Production for the week	225,088 tons.
" last week	224,643 tons.
Increase	445 tons.
Shipments—	
To Pittsburg and river points........	3,711 cars.
To points West of Pittsburg........	55,72 cars.
To points East of Everson............	2,258 cars.
Total	11,541 cars.
Last week	11,638 cars.
Shipments in tons for week........	245,747 tons.
" " " last week........	254,014 tons.
Decrease	8,747 tons.
Masontown Field	
Shipments for week	553 cars.
" last week................	693 cars.
Decrease......................	140 cars.
Shipments in tons..................	14,378 tons.
" last week................	18,018 tons.
Decrease	3,640 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

The Metal Markets.

LONDON—Tin—£135-£127 15s. Sales, 650 tons spot; 1,330 tons futures.

Copper—£53 10s-£53 7s 6d. Sales, 1,200 tons spot; 2,100 tons futures.

Lead—£11 12s 6d-£11 11s 3d.

Spelter—£18 10s-£18 5s.

NEW YORK—Tin—$29.95-$28.60.

Copper—Lake, $12.12½; electrolytic, $11.75; casting, $11.75-$11.50.

Lead—$4.15.

Spelter, $4.40.

ST. LOUIS—Lead—$4.00-$3.95.

Spelter—$4.15.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....36c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.85 per lb., in small lots; lot of 100 pounds, $1.10 per lb.: special price on large lots

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including May 12, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	332,036	161,569
Tidewater	1 7.389	35,418
Southwest	19,596	94,196
Eureka	11,607	368,183
Buckeye, Macksburg oil	361	158,967
New York Transit	286,185	
Southern	293,446	....
Crescent	77,628	....
Total	1,144,743	822,609
Daily averages	104,068	74,812
Buckeye } Indiana Local Division }	566,140	525,152
Daily average	51,196	47,741

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
May 7	$1.85	$1.20	$1.20	$0.88	$0.88	$0.83
May 8	1.85	1.20	1.20	0.88	0.88	0.83
May 9	1.85	1.20	1.20	0.88	0.88	0.88
May 10	1.85	1.20	1.20	0.88	0.88	0.83
May 12	1.85	1.20	1.20	0.88	0.88	0.8
May 13	1.85	1.20	1.20	0.88	0.88	0.8

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 28
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	10.75	c
Copper, light bottoms	9.50	c
Heavy Composition	10.75	c
Brass Turnings	7.00	c
Heavy Brass	8.62½	c
Light Brass	7.87½	c
Heavy Lead	3.90	c
Tea Lead	3.70	c
Zinc Scrap	3.12½	c
No. 1 Pewter	19 00	c

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4 75

The Alabama miners have called their state wage conventon to meet in the City of Bessemer June 6, when they will formulate a wage scale for presentation to the operators, June 23, the present wage scale expiring July 1. It is anticpated that the present wage scale will be renewed.

New Sheet Making Methods.

Thomas V. Allis, of Bridgeport, Conn., has constructed a furnace in which the long heating chamber is divided into comparatively short parallel chambers in one advance of the other, with passages between. The temperature of each may be regulated without materially altering the temperature of the adjoining chambers. This graduation of heat is appeciated as essential in the manufacture of black plate, which require an even mild, "soaking" heat. The first chamber can be very hot, quickly heating the sheets and overcome chilling by the constantly entering cold metal. The next chamber may be of milder temperature, and so onward to the last where the metal is given that soaking mellowing heat, so necessary to uniform ductility. With the improved furnace the packs are delivered at a uniform mellow heat and without exposure to the cooling and oxydizing influence of air and unevenly heated currents direct to the first pair of rolls. The heat and flame is directed across the furnace and not lengthwise. The heat of each chamber and its contents is always under complete control.

Mr. Allis has also patented a method for rolling sheets. The metal is rolled at each step at right angles to the previous rolling. Each step in rolling does not entirely change the direction of the grain produced by the previous step, so that by changing the direction of rolling in each step the fiber or grain of the metal will become so mixed that there will practically be no pronounced grain, but a laminated structure or condition of marked toughness so essential to cupping and drawing.

Entertaining the Trade.

Edward F. Austin, manager of the Pittsburg office of the Stilwell-Bierce & Smith-Vaile Company, assisted by his associates Messrs. Wagner and McClurg, entertained a number of their business friends at their offices in the Smith Block on Saturday evening last. Stereopticon views of the company's line of pumps, heaters and air compressors together with a number of other slides were shown after which the party was entertained by Mr. E. M. Wagner with vocal selections and recitations.

Henry Ulrich, machinst and pipe fitter, has plans prepared for an 80x100 foot extension to his plant in Braddock street, Allegheny. Mr. Ulrich reports a good demand for high pressure steam fitting work and finds it necessary to enlarge his plant to care for increased business. A 20-inch hydraulic pressure bending machine is being installed.

The Heating Effect of Coal.

In the May issue of Mines and Minerals in an article entitled "The Heating Effect of Coal," W. R. Crane says:

It is the object of this article to give a simple method, together with a description of apparatus, within the reach of any worker in brass, which will permit such tests to be made with ease and dispatch and with a fair degree of accuracy. In fact, we do not hesitate to state that, with apparatus constructed and tests made according to the plans and directions given there, just as accurate results can be obtained as with the very expensive apparatus usually employed for such work.

Although it is desirable to obtain the exact calorific power of fuel, yet for most purposes the relative heating effect is all that is necessary. Even a poorly constructed piece of apparatus will give fairly accurate relative results, yet such apparatus should be tested to see if the results with a certain fuel are concordant; if not, it must be discarded.

Such an apparatus (known as a calorimeter) should be in every superintendent's office, whether he has charge of a mine or foundry, and regular and systematic testing should be carried on with all fuels used, especially when they are being changed.

The value of a fuel depends largely upon what it is to be used for. The commercial value differs widely from the actual value, or the value as a heat producer. It is a well-known fact that the appearance of a coal is the prime factor governing its marketableness. A coal, excellent in every respect, yet having the external appearance of shale or a poorer grade of coal, cannot be sold until a special market has been created for it, and even then it is no easy task, as such coals are too liable to be adulterated by unscrupulous operators.

The method of mining and the ease with which a coal can be placed on the market affect the commercial value greatly, thus producing a specific value, which, as a rule, is far from constant. On the other hand, the actual value as a fuel is constant, varying only with the proportion of fixed carbon and volatile matter.

It is a common mistake to consider that a coal. bearing the same name and produced by the same district, has the same value as all other coals from that district. The amount of heat obtainable from such coals will depend not only upon the actual variations in quantity and quality of the coals belonging to the same horizon, but also on the different furnaces and methods of combustion. The age of the furnace and boiler. as well as the kind, and probably most of all the methods of firing, such as care of grate, ventilation, etc., will have even a more important bearing upon the actual heating effect of a given fuel than will its character—composition, etc. In other words incomplete combustion is often responsible for the small amount of heat obtained, rather than the coal, which generally receives most of the blame. The duty test of a certain coal in a particular furnace will therefore give the amount of heat obtainable for the coal in that furnace, under the various conditions above mentioned, but will give data of little value for other furnaces with their attendant conditions. The results will simply be relative for the coal in the particular furnace. It will therefore appear to be necessary for the comparison of coals, first to produce perfect combustion; second, to have the conditions governing the combustion constant.

Technical Bodies.

In connection with the annual meeting of the American Association for the Advancement of Science, to be held in this city, in June, Dr. I. C. White proposes to guide a party for a week in the study of the coal measures and M. R. Campbell will conduct an excursion to the abandoned channels of the Mononagahela river.

The Centenary of Hugh Miller. It is proposed to commemorate the 100th anniversary of the distinguished Scotch geologist, who was born in Cromarty, October 10, 1802. It is hoped to secure sufficient funds to justify the foundation of a Hugh Miller Institute. Subscriptions may be sent to John M. Clark, State Hall, Albany, N. Y.

A business meeting of the Engineers Club. of Philadelphia will be held Saturday, May 17, at which Professor Oscar C. S. Carter will read a paper on "The Southwest and the Air District Traversed by the Engineers of the Mexican Boundary Commission," illustrated.

The Foundrymens' Association, of Reading, Pa., has filed an application for a charter. The object is to "encourage and protect the interests of foundry operators, promote harmony and encourage uniform customs among the foundrymen." A board of trustees will manage the association.

The Hardie-Tynes Machine & Foundry Company shipped a 1,000 horsepower Corliss engine to Beaumont, Tex., last week and is making five Corliss engines for the Buckeye Cotton Oil Company. This firm alone is turning out three Corliss engines a week.

Ore Situation at Cleveland.

The freight market in the last few days has taken on a more hopeful tone. This is brought about largely by the increase in the demand for grain tonnage. Shippers in Fort Williams and other ports at the head of the lakes have been asking for boats freely, and are now offering 1⅞ cents for immediate loading, nothing being done in the way of advance chartering. This has relieved the ore trade of the necessity of finding employment for all of the boats that are bringing cargoes down, with the immediate result that the ratio between loads and boats is more nearly even. There are still, however, a few boats in excess of the demand for them in the ore trade, the grain operations not being able to afford complete relief. The free chartering of wild boats has continued to congest the docks at the lower lake ports, although at present the delays are not so severe as they were at the beginning of the week.

The ore situation has not changed in a week. The increased supply of grain has taken a few boats out of the ore trade, as has also the better supply of package freight, making the surplus of tonnage over the demand appreciably less. This, however, has not stopped the tremendous shipment down the lakes, nor has it abated the flood of boats arriving at Lake Erie docks nor eased the congestion.

Trade Publications.

The Cox & Sons Company, Bridgeton, N. J., is sending out a neat catalogue descriptive of its pipe-threading and cutting-off machines, power and portable forges, engines, etc. The company manufactures pipe-threading and cutting-off machines in sizes from 8 inches to 18 inches, etc.

Pawling & Harnischfeger, Milwaukee, have just sent out Bulletin No. 10, a handsomely illustrated catalogue showing the company's chain block traveling cranes and standard I beam trolleys. Pawling & Harnischfeger are among the most extensive makers of electric traveling cranes and traveling electric hoists but have a strong adjunct in the chain block cranes and I beam trolleys. This portion of their business has grown in response to a constant demand for hand-driven lifting and carrying devices of moderate capacity where there is no special need for electric traveling cranes and traveling electric hoists, or where the latter cannot be used because there is no electric current. The bridges for these cranes are made of I beams, fitted with truck wheels at each end, and operated through pendant hand-chain from the floor. Where bridges are of long span two beams are used, and bolted together in such a manner as to form a box section, which insures great lateral stiffness in the bridge.

One or two trolleys can be used on either the single or double I beam bridge.

These trolleys may very conveniently be used on overhead, continuous I beam tracks, suspended from the lower roof truss chords. When the standard I beam trolleys are intended to run upon the lower flanges of beams, the frames are made of cast-steel and are designed for the greatest possible strength. This type is made in sizes up to 10 tons. The wheels are of extra large size and furnished with a spherical tread. In the type of trolley which runs upon the upper flanges of double beam bridge, the trolley sides are of steel plates. This type is made in sizes up to 20 tons. All trolleys have four large steel axles, which are fitted with improved roller bearings, so that loads can be easily handled.

Buffalo Foundry Improvement—The Buffalo Foundry Company, Buffalo, N. Y., has recently decided to increase its capital stock from $10,000 to $200,000 and will immediately build one of the largest and most modern jobbing foundry plants in the country. It has secured a site of 6½ acres near Driving Park station, on the Belt Line Railway, Buffalo, giving connections with the 28 lines of railway entering Buffalo. The plant for the present will consist of one main foundry building 320x145 feet, steel structure, equipped with a two 30-ton and four 10-ton electric traveling cranes, six five-ton jib cranes and six 2 ton jib cranes, one 102-inch shell, one 84-inch shell and one 66-inch shell cupolas, one 15 ton air furnace together with air plant and every known modern appliance for the economical production of castings from the lightest up to the very heaviest. Pattern making and storage building 50x200 feet, three stories high, building 30x320 feet for the storage of raw materials. It is the intention of this company to use electrical power throughout, using the Niagara Falls electric power. The plant is being so arranged that an open hearth steel department 145x400 feet can be added together with what machine shops are found necessary.

The Moorefield Tannery Company is building a plant at Moorefield, W. Va. The main building will be 50x320 feet, with two wings each 50x 80 feet and a yard leech house 40x50 feet. An independent leech house will be 40x300 feet. There will be 250 vats and the capacity will be 30 tons of bark daily.

Pennsylvania Coal Statistics For 1901.

Mines and Minerals for May, commenting upon tables of Pennsylvania coal statistics for 1901, which it published in full, says:

The advance tables of coal statistics for the state of Pennsylvania, from the State Bureau of Mines present some interesting facts and furnish opportunities for comparisons of the statistics of 1901 with those of 1900, showing in striking manner the general prosperity of the year.

Pennsylvania contributes about one-half of the total production of coal mined in the United States.

In making a comparison it might be well to bear in mind that there was an anthracite strike in the fall of 1900, probably curtailing production of that year.

Had this strike not occured during the busy season, it has been estimated that the production of anthracite would have reached 56,000,000 tons for that year. The total production of coal from Pennsylvania mines in 1901 amounts to 140,820,187 tons against 130,535,680 tons for 1900, showing an increase of about 8 per cent and making a new record in production for Pennsylvania coal.

By far the larger percentage of gain was made by anthracite.

From all reports anthracite never enjoyed better prosperity than during the past year.

Coke shows a greater production in 1901 over 1900 by 940,044 tons with 1,725 more ovens and a greater yield per oven.

Three hundred and one fatal accidents occured in the bituminous regions, which shows 268,818 tons of coal mined for each life lost. This is a poorer showing than that made in 1900 when for each life lost 299,300 tons of bituminous coal were mined.

The number of fatal accidents in the bituminous mines for 1901 was 2.56 per 1,000 persons employed. This record is not so good a showing as that made in the previous year, when 2.43 deaths occured for every 1,000 employes.

The production of anthracite coal in 1901 per life lost was 116,776 tons. In 1900, 124,600 tons were mined for every life lost.

The number of fatalities in 1901 per 1,000 persons employed was 3.47.

In 1900 only 2.86 employes were killed for every 1,000 persons employed.

The mechanical department affords a striking example of the tendency of modern times in boiler practice at the mines.

In 1901 cylindrical boilers decreased 13½ per cent, and tubular boilers increased 16 per cent over those in use in 1900.

As regards haulage, a notable gain was made by compressed air locomotives in the anthracite regions, the steam and electric types about holding their own.

In the bituminous fields the increase was made by air and electric locomotives.

Taking the state as a whole, steam locomotives increased 2½ per cent, compressed air locomotives increased 57½ per cent; electric locomotives increased 28 per cent in 1901.

Sterling Company To Build--A meeting of the Sterling Steel Foundry Company will be held this week and a permanent organization effected. The company has closed for four acres of ground between Seventh and Eighth streets, Braddock, and will begin work at once upon a plant to be ready for operation by August. There will be a main building 120x400 feet, power house 30x60 feet, pattern, stock, and storage houses. The plant will be modern in every particular. The equipment will include two 15 ton open hearth furnaces, 15 molding machines, two 20, two 10 and one five ton electric traveling cranes and 10 air jib cranes. The power equipment will include two 100 horse power Westinghouse gas engines to be direct connected to generators and an Ingersoll-Sergeant air compressor. The output of the plant will be 600 tons monthly.

The company is composed of S. J. Wainwright, Jr., H. E. Wainwright. H. E. Wainwright, Jr., Uriah Tinker, and Howard J. Fisher. The local offices will be located in the Frick building, this city. Temporary offices are in the Times building.

J. A. Clark, C. W. Arnett, W. Hunter Atha, and W. C. and J. A. Jamison, of Fairmont, have organized the Fairmont Trust Company, with $100,000 capital to do a banking business, to operate gas and electric light plants and engage in all kinds of manufacture. The new concern is backed by several millions.

Reports just compiled by the West Virginia coal authorities show that in 1901 the aggregate of wages paid out in the Fairmont district was $3,218,217.

Railroad Contracts Awarded—The McClintic-Marshall Construction Company has been awarded the contract for the structural steel work in the new machine and erecting shops of the Pittsburg & Lake Erie railroad, at McKees Rocks. The value of the contract approximates $150,000 It is one of the last large pieces of work to be let in the general yard enlargement scheme of the railroad at that location.

The size of the building will be 170x500 feet. In perfection of interior arrangement with reference to fast and easy work the shop will be without a peer of its kind. The plans were made under the presonal supervision of Chief Engineer J. A. Atwood, and Superintendent of Motive Power L. H. Turner, of the Lake Erie and were finally approved only after all details had been made perfect.

One of the features of this shop will be traveling cranes of 120 tons capacity. These are designed to make it possible to pick up an entire locomotive of the largest type and lift it bodily over any other locomotive or obstruction that may be in the way to whatever place in the shop may be desired.

WEST VIRGINIA NEWS.

James A. Murphy of New York, representing London capitalists has secured options on 300 acres of coal near Clarksburg owned by John Gawthorp and others. The agent has arranged to pay $138,000 for the tract.

Anthony Bowen, secretary of the Clarksburg board of trade is endeavoring to secure a site in the central part of the state for a company of Bradford, Pa., investors who desire to build a glass factory for window making.

The United States Steel Corporation has in contemplation additions and improvements at the Bellaire works which will involve the outlay of about $1,000,000.

The B. & O. is opening bids on its improvements at Keyser consisting of a round house coal tipples and building for the housing of trainmen.

I. T. Townsend and H. Robinson, of Akron, O., are sellecting a location in Harrison county on the Short Line railroad for a sewer pipe factory.

Thomas G. Brady, agent for a New York syndicate has optioned 450 acres near Clarksburg for two steel and sheet mills.

Seven Principal Routes.

It is a well known fact that the C. M., & St. ?. Ry. system offers great many different routes ›etween Chicago and St. Paul and Minneapolis. ts main line between those points is especially vell known as the route over which runs the amous "Pioneer Limited" and the Government 'ast Mail Train. There are six or seven other outes over a number of which are run through oaches and sleeping cars, which are almost as lirect as the principal main line.

These various routes traverse the most in- eresting and attractive sections of Illinois, Visconsin, Iowa, and Minnesota, including the elebrated "Lake region" of Wisconsin, and ross the Wisconsin river at the famous "Dells," vhere is the most picturesque scenery in the Northwest.

The main line and several others include from 50 to 300 miles of romantic and picturesque cenery along the Mississippi river. On these arious lines are located the most important owns and cities in the Northwest.

Both one way and special excursion tickets ›etween Chicago, St. Paul and Minneapolis are ionored via any one of these direct lines.

The teachers attending the National Educa- ional Convention at Minneapolis will appreciate nd take advantage of this fact as they can iave a choice of routes going and returning.

Condition of the Blast Furnaces in the United States, May 1, 1902.

Compiled for the AMERICAN MANUFACTURER AND IRON WORLD.

LOCATION OF FURNACES.	CHARCOAL. Total No. Stacks.	CHARCOAL. IN BLAST. No.	CHARCOAL. IN BLAST. Weekly capac'y	CHARCOAL. OUT OF B'ST No.	CHARCOAL. OUT OF B'ST Weekly capac'y	ANTHRACITE AND COKE. Total No. Stacks.	ANTHRACITE AND COKE. IN BLAST. No.	ANTHRACITE AND COKE. IN BLAST. Weekly capac'y	ANTHRACITE AND COKE. OUT OF B'ST No.	ANTHRACITE AND COKE. OUT OF B'ST Weekly capac'y	BITUMINOUS AND COKE. Total No. Stacks.	BITUMINOUS AND COKE. IN BLAST. No.	BITUMINOUS AND COKE. IN BLAST. Weekly capac'y	BITUMINOUS AND COKE. OUT BL'ST No.	BITUMINOUS AND COKE. OUT BL'ST Weekly capac'y
Alabama	5	3	956	2	475						39	30	28,815	9	6,490
Colorado											3	3	4,213	0	0
Georgia	3	0	0	3	840						1	0	0	1	740
Illinois											19	18	35,106	1	2,000
Kentucky											8	5	2,200	3	1,405
Maryland }	5	1	110	4	260						5	4	6,253	1	500
Virginia }											21	15	10,496	6	3,502
Missouri	1	1	450	0	0						1	1	885	0	0
New England	7	3	289	4	360										
New Jersey						9	3	3.597	6	3,116					
Spiegel						3	3	536	0	0					
New York	3	2	702	1	75	7	2	1,398	5	2,798	10	4	6,135	6	3,530
North Carolina											2	0	0	2	468
Ohio—Eastern, Central and Northern											28	22	38,872	1	2,100
Hanging Rock District	7	1	43	6	477						12	11	6,653	1	54
Hocking Valley											3	2	898	1	350
Mahoning Valley											13	12	27,178	1	2,000
Oregon and Washington	2	1	100	1	280										
Pennsylvania general	9	2	87	7	556						6	5	5,718	1	1,150
Juniata and Conemaugh Valleys											15	9	13,615	6	2,653
Lebanon Valley						11	9	6,668	2	1,100					
Lehigh Valley						30	23	12 644	7	3,545					
Pittsburg district											} 34	32 {	79,328	2	2,600
Spiegel													2,587		
Schuylkill Valley						16	11	9,467	5	3,610					
Shenango Valley											18	16	25,199	2	2,690
Susquehanna Valley, Upper						2	1	350	1	335					
Susquehanna Valley, Lower						11	7	6,883	4	1,350					
Tennessee	3	1	82	2	615						18	10	6,530	8	4,770
Texas	4	0	0	4	890										
West Virginia											3	3	1,238	0	0
Wisconsin and Michigan	10	7	3,973	3	1,061										
Wisconsin and Minnesota											6	5	5,098	1	665
Total	59	22	6,792	37	5,889	89	59	41,543	30	15,844	260	207	309,517	53	37,962

Blast Furnaces May 1, 1902.

The following table gives the number and capacity of furnaces in and out of blast May 1, 1902:

Condition of Blast Furnaces in the United States May 1, 1902.

Fuel.	In Blast. No.	In Blast. Weekly Capacity.	Out of Blast. No.	Out of Blast. Weekly Capacity.
Charcoal	22	6.792	37	5,889
Anthracite and Coke	59	41,543	30	15,844
Bituminous and Coke	207	309,517	53	37,962
Total	288	357,852	120	59,695

Compared with April 1, the standing of the furnaces in blast was as follows:

Furnaces in Blast April 1, and May 1, 1902.

Fuel.	April 1. No.	April 1. Weekly Capacity.	May 1. No.	May 1. Weekly Capacity.
Charcoal	22	7,201	22	6,792
Anthracite and Coke	56	37,149	59	41.543
Bituminous and Coke	204	300,053	207	309,517
Total	282	344,403	288	357,852

The above comparison shows:

Increase in active charcoal furnaces, 0.
Decrease in weekly capacity charcoal furnaces, 409 tons.
Increase in active anthracite and coke furnaces, 3.
Increase in weekly cap. anth. and coke furn's, 4,394 tons.
Increase in active coke and bituminous furnaces, 3.
Increase in w'kly cap. bit. and coke furnaces 9,464 tons.
Net increase active furnaces, 6.
Net increase weekly capacity, 13,449 tons.

The following tables show the anthracite and coke and the bituminous and coke furnaces in blast in the various districts April 1 and May 1.

Anthracite and Coke Furnaces in Blast Apr. 1, and May. 1, 1902, by Districts.

District.	April 1. No.	April 1. Weekly Capacity.	May 1. No.	May 1. Weekly Capacity.
New Jersey	4	3,960	3	3,597
Spiegel	3	524	3	536
New York	2	1,2 2	2	1,398
Penna—Lebanon Valley	8	5,702	9	6.668
Lehigh Valley	20	10,364	23	12.644
Schuylkill Valley	11	9,079	11	9,467
Susquehanna Val. Upper	1	350	1	350
Susquehanna Val. Lower	7	5,938	7	6,883
Total	56	37,149	59	41,543

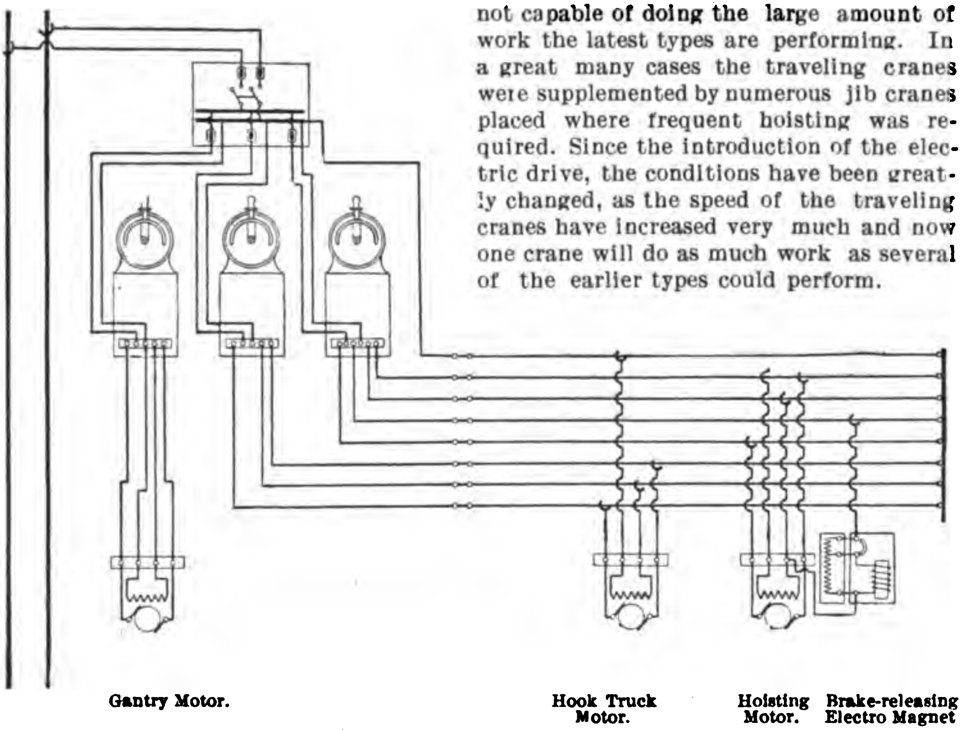
Bituminous and Coke Furnaces in Blast Apr. 1, and May 1, 1902, by Districts.

District.	April 1. No.	April 1. Weekly Capacity.	May 1 No.	May 1 Weekly Capacity
Alabama	26	25.404	30	28,815
Colorado	3	4.493	3	4,213
Georgia	0	0	0	0
Illinois	19	35,695	18	35.106
Kentucky	5	2,337	5	2.200
Maryland	4	5,943	4	6,253
Missouri	1	856	1	885
New York	4	6.206	4	6,135
North Carolina	0	0	0	0
Ohio—East'n, Cent. & Nth'n.	20	31.533	22	38,872
Hanging Rock	11	6.019	11	6,653
Hocking Valley	2	903	2	898
Mahoning Valley	13	29.911	12	27,178
Pennsylvania, general	5	6.095	5	5,718
Juniata & Conemaugh Val.	9	13.331	9	13.615
Pittsburg district	32 {	78.101	32 {	79,328
Spiegel		2.324		2.587
Shenango Valley	15	23,841	16	25,199
Tennessee	11	7,134	10	6.530
Virginia	16	10,459	15	10.496
West Virginia	3	3,838	3	4.238
Wisconsin & Minnesota	5	4.660	5	5,098
Total	204	300,053	207	309,517

ELECTRICALLY OPERATED CRANES AND METHODS OF CONTROL.

FRANK C. PERKINS.

THE electrically driven overhead traveling crane has become one of the most important pieces of mechanism used in the modern workshop at the present time. It is but recently that special attenion has been called to the improvement of cranes for heavy work, but new economic conditions, closer competition and the introduction of cranes driven by electric motors have produced an entire change of practice in the past few years. Every progressive manufacturer in this country and abroad will eventually have installed these useful appliances for foundry and machine shop and the methods of control and operation are of more than passing interest, and will be taken up in detail, especially as applied to foreign cranes. The two classes of cranes in uses at the present time include first, the swing or jib cranes, derricks and the like; and second, the different kinds of bridge cranes, gantries and overhead traveling cranes. Only a short time ago all types of cranes were slow in action and not capable of doing the large amount of work the latest types are performing. In a great many cases the traveling cranes were supplemented by numerous jib cranes placed where frequent hoisting was required. Since the introduction of the electric drive, the conditions have been greatly changed, as the speed of the traveling cranes have increased very much and now one crane will do as much work as several of the earlier types could perform.



Gantry Motor. Hook Truck Motor. Hoisting Motor. Brake-releasing Electro Magnet

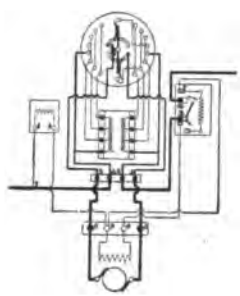
Electrically Operated Crane Motor Connections.

Where there is a large open floor space the traveling crane is without question the better form, but for special purposes and in certain cramped locations the electrically operated swing crane is used to better advantage. The traveling crane at present does the work of more men in the modern workshop than any other machine; and there is no piece of mechanism, other than the power generators on which the great output of a modern plant is so dependent. It carries the many castings about the shops to the various tools, returning the finished product to the testing room or carrying it forward to other tools and later to the shipping department. It is also used to great advantage in handling the large electrically driven self contained machine tools which are now frequently taken to the heavy castings instead of moving the casting about the shops to the different machines. In this way a number of electric tools may work upon the same large piece of machinery or large casting at the

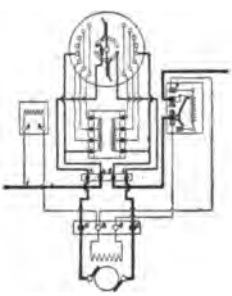
same time, saving a vast amount of time, reducing the cost of output, and increasing the economy of operation.

The two types of electric cranes are the multimotor or "all electric" and the single motor crane. With the latter form the various movements are obtained from one motor which is always running in one direction and at usually a constant speed, the motor being carried upon the crane. This type of crane, while it does away with the flying rope or square shaft of the ordinary mechanical crane, still has to retain all of the clutches, square shafts, tumbler bearings and gears of the old forms. Even with a single speed for each movement there must be at least six clutches and friction devices, while a still greater number are necessary with the single motor mechanism if a number of speeds are desired as is frequently found necessary in modern machine shop practice. With the single motor cranes, the means of transmitting power from the motor to the mechanism on the trolley, as well as the operation of the clutches, are complicated, uncertain and very undesirable, while the cost of maintenance is much greater than the multimotor crane on account of the increased number of parts, and excessive wear.

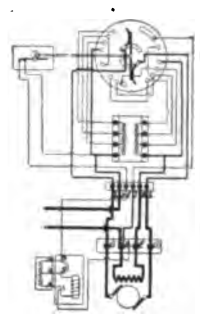
By the use of several motors on the multimotor electric traveling crane, the whole mechanism is greatly simplified, and the losses by friction are greatly reduced. Great accuracy and convenience is obtained by using a separate motor for each movement of the crane, and there are no gears required expect those which transmit the power from the motors to the winding drum for hoisting, or the traveling of the crane.



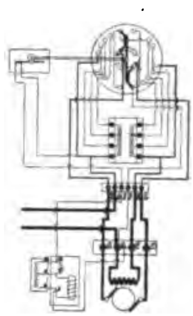
System A.—Shunt wound motor controller without braking.



System B.—Shunt Wound motor controller braking in either direction.



System C.—Series wound motod controller with brake connection for hoisting motors.



System D.—Series wound motor controller with brake.

The electric traveling crane consists of the motors and transmitting gears on the trolley, and a bridge supported upon wheels on an elevated track with a longitudinal motion on the runway rails and a transverse motion upon the bridge. The earliest traveling cranes were operated by hand and later were designed to be driven by independent steam engines; while other mechanical forms were driven by square shafting; a movable bearing being employed having a cap, which, when locked in place, enabled the shaft to be driven at a speed which was quite impossible when the shaft was carried in the open bearings employed in previous practice.

With the multimotor or "all electric" traveling crane, one motor is used for the traveling bridge; one for traversing the carriage; and a third motor is used for hoisting the load. The changes of speed are usually made by changing the speed of the motors by means of rheostats; and the various movements are controlled by stopping, starting or reversing the motors which govern the different movements.

The single motor crane has some points of advantage which must not be overlooked, although it also has the disadvantages above mentioned. With the multimotor types, a great amount of current is required to start the load as the motor starts from rest, and it takes a certain time to get under way, while the single motor type takes less time and less current to attain the normal speed, as the motor is in continual operation. It is said that the single motor crane is not only more prompt in starting but can perform a much greater amount of work in a given time,

the moving parts being up to speed acts as a flywheel to aid in overcoming the resistance of the load at starting.

The speeds which are most desirable and the range of control varies according to the work to be done, high speeds being satisfactory for handling rough materials, and slow speeds or moderate speeds being better adapted for foundries and machine shops.

The Helios Elektricitats Actien Gesellschaft of Cologne-Ehrenfeld, Germany, have installed a number of electric cranes abroad and it may be of interest to note their types of controllers and the methods of operation; while to those engaged in driving electric cranes, the various connections of motors and controllers, may be found worthy of consideration. The accompanying illustrations and drawings show the details of these connections and may be seen in various trolleys, and electrical traveling cranes, as used in various shops and factories in this country and abroad, of American and European design and construction.

The Helios controller has the exciting coil of the magnetic blowout placed around the axle of the apparatus, so that the contact lever and back plate become the poles, between which all the contacts are located. The whole of the mechanism is mounted on one side of the cast frame. The switch box is arranged to be combined with the resistance and mounted on the top of it, or the switchbox and resistance may be separated in which case connecting cables are required.

Another diagram shows the connections of a complete electrical installation for an overhead crane where "Helios" controllers are employed system, D being used for the "hoisting" motors; as will be noted later; and System B for the "hook-truck" and "gantry" motors.

The resistance coils of the controllers are mounted on iron frames protected by perforated sheet metal, the coils being wound in porcelain cylinders. The controllers are fitted with lever handles, hand wheels or chain wheels, but for traveling cranes the combination and wheels and levers are found most desirable.

The controller on the left fitted with vertical lever, works through a right angle from back to front; the middle controller fitted with a hand wheel, and the right hand controller fitted with a horizontal lever working through an angle of about 80 degrees from top to bottom of its stroke. With the three controllers of an electric crane so arranged, the motors can be connected so that the movements of the load may be said to be sympathetic with the movements of the drivers hands. By moving the left hand controller handle backwards or forwards, the hook truck may be made to travel backwards or forwards, by the connections shown while by moving the hand wheel of the middle controller to the left or right, the gantry may be moved to the left or right, and by moving the right hand controller up or down, the load may be raised or lowered. The controllers for "hoisting" and "hook truck" are often combined in a double apparatus.

When series motors are used, switching in and out is effected by the controller alone but with shunt wound motors a field magnet switch and resistance is used as well. This resistance is placed in the main circuit as shown and saves the insulation of the shunt winding from being damaged by the high voltage induction current which takes place at "break". When the switch is closed, the armature current is regulated in the usual way by the controller. By this method of controlling shunt wound motors the field is always fully excited before the armature receives current. This is of great importance in the case of large shunt wound motors, as owing to self induction, the current in the field windings does not reach its maximum for some time after the circuit is closed and the common practice of switching in the armature at the same time as the field, results in a wasteful consumption of current.

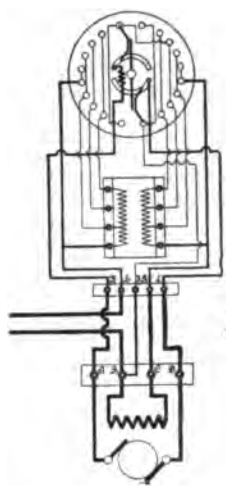
In order to stop the motors quickly, or enable the load of a crane to be lowered gradually, the controllers are frequently provided with "brake" positions which short circuit the armature, and in the case of series wound motors, the field winding also, through a portion of the resistance. The motor being still in motion works as a

dynamo and thus brakes itself. This braking effect may be employed in one or both directions of rotation with series wound as well as shunt wound motors.

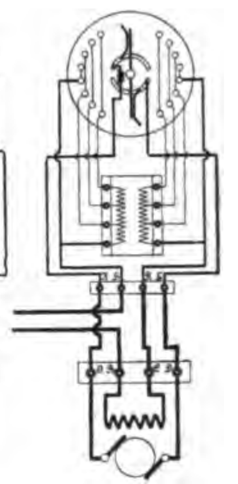
There are four systems or methods of connecting these controllers, which is indicated, as A, B, C, and D. In the first the motor is simply run in either direction, according to which way the handle is moved, without any braking action, and is usually used for other purposes than the operation of cranes, where braking to be avoided. The connections of a shunt motor controller under system A, and for a series wound motor, are fully shown.

The second method or system B, nas a "brake-position" provided for each direction of rotationn, and is chiefly used for controlling the "hook truck" motors and "gantry" motors of cranes. The connections for the shunt wound motor controller of this type, and for the series wound motor, are given in the diagrams.

For "hoisting" motors, the controller under system C has a brake position for each direction of rotation and is also provided with an idle contact (placed between the contact for "lowering" with current and the brake contact for "lowering") so that the load can be lowered without current and without brake action. This system of connections is generally used in conjunction with an electric device for releasing the mechanical brake and is only used for the "hoisting" motors of cranes. It is especially suitable for cranes which have a self-locking gear. The accompanying diagram shows the connections for this type of controller with a series wound motor.



System B.—Series wound motor controller with braking in either direction.



System A—Series wound motor controller without braking.

The last system, D, of connections for controllers for "hoisting" motors, has an increased number of brake-positions for "lowering" and also has an idle contact, but is used for the control of "hoisting' motors of cranes whose gearing is so free that it is put in motion by the weight of the load alone, if the mechanical brake is taken off.

All of these methods of connection can be combined with the shunt wound electro-magnetic brake-release, and with this arrangement the mechanical brake is released as soon as the hand lever is moved from the "off" position to the one side or the other; and vice versa, the brake is applied automatically as soon as the hand lever is brought back to the "off" position. The brake-release is noted in diagram of connections of controller with series wound motor nnder system D.

The illustration also shows an American type of electrically driven traveling crane as built by the Shaw Electric Crane Company, while the other illustration an early form of crane in use in Brussels, Belgium at the works of the engine builders, Ateliers De Construction, H. Bollinckx. The Helios Elektricitats Actien Gesellschaft of Cologne-Ehrenfeld, Germany, use the type of crane and method of control which has been described above and one of these cranes may be seen of the erecting shop of their works; while other figures show two other German types of electric cranes in the works of the Elektricitats Actien Gesellschaft, formerly W. Lahmeyer & Company, of Frankfort, on Main, the former being a single electric crane of 10,000 kilograms capacity built by Collet & Engelhard, of Offenbach on Main; and the latter shows a pair of electric cranes in a double erecting shop, each having a capacity of 5,000 kilograms, and constructed by Carl Schenk, of Darmstadt.

The electric trolley of traveling crane noted, is of American construction and was built by the Cleveland Crane & Car Company, while the alternating current polyphase induction motor crane of 15 tons illustrated, was designed and constructed by the Swiss firm, Maschinenfabrik Oerliken near Zurich.

Alloys Of Iron.

THE metals tungsten, molbydenum, uranium, and vanadium are still attracting much interest in the steel industry, because of the beneficial properties which they impart to steel, although the alloys ferro-uranium and ferro-vanadium are still in the experimental stage as to their actual commercial value; the ferro-alloys of molybdenum and tungsten have passed this stage. The demand for tungsten did not increased during 1901, but molybdenum has been greatly in demand, and its market value has remained nearly constant.

The sources of tungsten are the three minerals, scheelite wolframite, and hubnerite, and of these scheelite, a tungstate of calcium, is the one that can be used in producing the metal, or ferro-alloy. Thus far scheelite has been found in only one locality in the United States in sufficient quantity. Wolframite and hubnerite occur abundantly, and the sources of supply greatly exceed the demand.

For a number of years practically all the tungsten used in the United States was imported from England, Austria, Hungary, Saxony, Germany, and Australia. The principal deposits in this country have been found in Arizona, Nevada, and Colorado. Deposits have also been found in Oregon, Washington, Idaho, Montana, New Mexico, South Dakota, Connecticut, and North Carolina. The Arizona deposits are in the Arivaca district, Pima county; in the Dragoon mountains, Cochise county, and 60 miles South of Hackberry, Mohave county. The Nevada deposits are near the base of Wheeler Peak, in the South Mountains, about 12 miles South of Osceola, White Pine county. The Colorado ores have been found in quantity in San Juan, Boulder, Gilpin, Ouray, and Lake counties, the principal mines worked in 1901 being those in Boulder county, where the Great Western Exploration & Reduction Company has been recently organized both to mine and reduce the ores and to manufacture ferro-tungsten alloy. The massive scheelite deposit in the Cliff mine in the Virtue district, East of Baker City, Oregon, carries considerable free gold. There has been little tungsten mining at the Harrison and the Durango mines in the North Lead district of South Dakota; and also at the scheelite mines of the American Tungsten Milling Company, near Long Hill, Fairfield county, Connecticut.

Tungsten has been used for making colored cotton goods "fast" or washable, for rendering clothes non-inflammable, for the manufacture of stained papers, for coloring glass; as an alloy with copper and aluminum for the manufacture of propeller blades; as calcium tungstate in Roentgen ray apparatus. Now the chief use, either as ferro-tungsten or as the powdered metal, is in making tungsten steel. The production of tungsten ores during 1901 amounted to 179 tons, concentrated from 1,221 short tons of crude ore, valued at $27,720, at an average price of $154.86 per ton. The price of tungsten ores has decreased from 50 to 75 per cent during the last two years.

Molybdenum, found as the minerals molybdenite and wulfenite, generally occurs in beds, or is disseminated through crystaline rocks, granite gneiss, syenite, and granular limestone. It has been found abundantly in many localities, as in California, in Mono county 12 miles Northwest of Bridgeport, on the West fork of Walker river, where the molybdenite core is about 20 feet in diameter; on Alamo mountain, in Northeastern Ventura county, where the vein is said to be from eight to 15 feet wide. In Washington, molybdenite deposits are worked by the Crown Point Mining Company, of Seattle, on Railroad creek in the Stehekin mining district, in Western Chelan county. This deposit is associated with gold, silver, and copper ores, and is in quantity. In Montana, at the Leslie copper mine, in Missoula county, molybdenite was found in quantity in the upper parts of the mine. In Utah, molybdenite deposits have been discovered near Leamington. Millard county, but not sufficient development work has been done to determine their extent. In Arizona a vein of molybdenite five feet wide is reported in the Santa Rita mountain district, Pima county. In New Mexico, molbydenite is reported in quantity about 25 miles from East Las Vegas, San Miguel county. It is also reported in quantity near Portage Aitkin county, Minnesota, and near Cripple Creek, Colorado. A deposit of molybdenite of good indications has been developed near Skagway, Alaska.

The chief uses of molybdenum until recently have been in determining phos-

phoric acid by ammonium molybdate, and in preparing "blue carmine" for coloring porcelain. The ferro-alloy of molybdenum is now used in making a special steel, of which it gives valuable properties. The production of molybdenite in the United States in 1901 has probably not been over 10 or 15 tons, which does not supply the demand. The ore, to be marketable, must contain over 45 per cent of molybdenum and be free from copper. The average price of a 50 to 55 per cent ore is probably about $400 a ton. The increase in the domestic production of 1902 over 1901 should be large.

During the last few years there has been some demand for these metals for experimental work as to their beneficial effect upon steel. Uranium is found in the forms uraninite, gummite, and carnotite. The principal occurrences of uraninite are at the Wood, the Black Hawk, and the Kirk mines near Central City, Gilpin county, and on Dolores River at the mouth of Disappointment Creek, Montezuma county, Colorado. It has also been found on the Eastern slopes of Paradox Valley, Montrose county, Colorado. It has also been found in doubtful quantity in the Ross Hannibal mine in the Ruby basin of the Black Hills, South Dakota; in the President mine, near Elizabethtown, Colfax county, New Mexico; and with gummite also, in some of the pegmatitic dikes of Mitchell county, N. C.

Carnotite, which contains the oxides of both uranium and vanadium, occurs at La Salle creek, six miles from Cashin, Montrose county. Colorado; and it is reported from the Western slopes of the La Salle mountains in Southeastern Utah.

The other principal source of vanadium is canadinite, which has been found in some quantity at the Vulture and the Phoenix mines in Maricopa county, and at the Mammoth mine, near Oracle, Pinal county, Arizona; and at Lake Valley, Sierra county, and at the Mimebrs mines, near Georgetown, Grant county, New Mexico. Vnadium has been obtained from certain slags at Creusot, France; and it has also been found in the ash of certain coals—a source that is attracting the interest of manufacturers and chemists. Both uranium and vanadium, as ferro-alloys, increase to a remarkable degree the tensile strength and toughness of steel, though no commercial steel seems thus far to have been made with them. Uranium compounds are used in manufacturing and decorating porcelain and glass, and canadium is used for vanadium bronze in the place of gold bronze. The production of uranium vanadium minerals during 1901, confined for the most part to Colorado, amounted to about 375 short tons of the crude ore. The highest recorded price for the crude ore was $150 per ton; uranium oxide has been sold as high as $1.20 per pound.

Finely-divided Iron Ores—In a treatise on the use of finely-divided ores obtained by concentration Prof. Wilborgh, of Stockholm, reviews the methods by which such ores can be separated mechanically or magnetically, thus permitting the utilization of what would otherwise be wasted. The fine ore which can be smelted in the blast furnace is limited as regards quantity by its tendency to pass through the fuel, and therefore descend without being completely reduced; but it may also be made into briquettes or turned into spongy iron. Briquettes made from fine ore cemented by quick or slacked lime, with the quantity of water necessary to make a thick paste, harden sufficiently when dried in air. What is called "ore coke' is made by mixing the fine ore with tar or bituminous coal, 30 per cent of the latter to 70 per cent of iron, and highly heating the whole, which yields a hard and compact product.

Steam Turbine Progress—Almost gourd like has been the recent growth of the steam turbine in its application to large plants. Two of the most important American firms have been occupying themselves during the past few years with experiments in this direction, with the idea of improving upon existing forms. Practically speaking, all the work with large units has been achieved by the English Parsons turbine. The Westinghouse Company, which has secured all the American rights, are at present in process of building eight, ranging from 750 to 2,500 h. p. Highly satisfactory results are reported. It would appear that a 2,500 h. p. machine has been employed for a year in an electric light and power plant at Hartford, Conn. It is said to be the largest and most economical engine in the world.

NOTES FOR THE CHEMIST.

Starch Indicators—F. E. Hale (Am. Jour. Science May, 1902.) A paper giving a very exhaustive study of the reactions between iodine and starch solutions, especially the loss of iodine due to the formation of compounds having a red or purple color before a permanent blue is obtained. The author recommends a solution containing some free potassium iodide and prepared as follows:—Five grams of pure starch and two grams of potassium iodide are ground up in 25 c. c. of water, poured into 75 c. c. of boiling water, and boiled for 15 minutes. Dilute with hot water, to 500 c. c. and boil 45 minutes. Allow to settle and filter. The iodine assists in the solution of the starch and helps to prevent fermentation. This indicator produces a clear blue and gives sharp end reaction. The paper contains tables giving results with various starch solutions and covers 20 pages.

Electrolytic Determination of Copper—Willame (Abstract in Jour. Soc. Chem. Ind.) In cases where it is necessary to guarantee the percentage of copper to the second place of decimals, the amount of substance taken for test must be sufficient to preclude tenths of a milligram exercising any influence on this second decimal place in weighing. The author therefore recommends increasing the amount of sample from 0.5-1 gram to about 10 grams, in which event about 99.67 per cent of the copper will be deposited at the cathode. He employs a weak current, and effects the electrolysis of copper sulphate in the presence of 20 c. c. of nitric acid (1.20) in a total volume of 200 c. c. The spiral anode and conical cathode are placed about 15 m. m. apart. Operation is complete in about 48 hours.

Determination of Copper by Aluminum Foil—George E. Perkins. (Jour. Am. Chem. Soc. May, 1902.) A modification of the process by A. H. Low. The copper is brought into solution as a sulphate. The solution evaporated until free from nitric acid. Dilute with 50 c. c. water for each 10 c. c. sulphuric acid present. Add two or three pieces of sheet aluminum (25 gauge) about 40 m. m. (1 9-16 inches)square with one corner turned up for convenience in handling. Boil solution for about five minutes and all the copper will be precipitated. Instead of redissolving the deposited copper and titrating with cyanide solution, more satisfactory results are obtained by washing the copper into a tared Gooch crucible, giving a final wash with alcohol, burning off, drying and weighing as metallic copper. Use only enough asbestos to produce a good filter. In washing with alcohol and burning, the same care is needed as in the electrolytic method that too much alcohol is not used.

Notes on Iron Analysis—George T. Dougherty, Chicago (Iron Age, May 8.) Methods for the determination of sulphur, manganese and graphite in iron and steel; revivification of old copper solutions and the mechanical loss of graphite from drillings.

A Tandem Blast-Furnace Gas Engine—The Bohemian Mining Company has laid down a 300 h.p. Delamare-Deboutevllle gas-engine at its Konigshof iron works for working with blast furnace gas; and this is the first engine for such working that has been made with its cylinder in line, one behind another. The diameters are 70 cm. (27 inches), and the stroke 80 cm. (2 feet 7 inches); The engine makes 150 revolutions per minute, corresponding with a piston speed of 4 m (13 feet) per second; but the working is very regular, while there is no vibration, and no difficulty is experienced with the stuffing boxes through which the piston-rod passes. This arrangement has the advantage of great simplicity and regularity, which latter quality is due to the circumstance that the motive efforts, two for every other revolution, are distributed more uniformily than with cylinders placed opposite one another; and two effective strokes are immediately followed by two others without effort, so that a less heavy fly-wheel is sufficient viz: one of 22 tons. The ignition of the charge is effected by the electric spark, produced by the Rhumkoff coil; and the starting is easily effected by the aspiration and compression, in the cylinders, of a small quantity of benzine, ignited at the right moment by the electric spark.

STANDARDIZATION OF PIPE FLANGES AND FLANG FITTINGS.

BY ROBERT E. ATKINSON, (Paper read before the Institution of Mechanical Engineers, England.)

[Continued from page 582]

Various other conditions arise which affect the decision as to the pitch of bolts, similar to those met with in deciding the thickness of flanges and makes the point difficult to settle by theoretical calculation, owing to strains to which the joint is sometimes subjected by contraction and expansion when the steam is alternately admitted and shut off. The jointing ring too is often affected by water condensation acting upon it, and particularly so when the material is asbestos. Again, in the case of plain flanges without recesses, trouble frequently occurs by the displacement of the jointing rings when the centres of the bolts exceed this dimension. The recognition of this limit of 4½ inches, therefore, and the observance of the principle of the multiple of four with respect to the assemblage of bolts, together determine the number of bolts to be used in the various flanges. Thus for pipes from ½ inch to 2½ inches, inclusive, four bolts are adopted; for three inch to seven inch pipes, eight bolts: for 12 inch to 16 inch pipes, sixteen bolts; for 17 inch to 20 inch pipes, twenty bolts: and for a 21 inch to 24 inch pipes, twenty-four bolts. The change from four to eight occurring on three inch pipes necessarily makes the number of bolts more than is strictly required; but the only alternative is either to adopt a number not divisible by four, or to use only four bolts, which would make the circumferential pitch as much as 4.71 inches; and this when working at, say, 250 pounds pressure. Assuming the adoption of eight bolts, it may be pointed out that the actual difference is not so great as it seems, inasmuch as if four were used, ⅝-inch or ¾ inch bolts would be necessary, but with eight probably those of ½-inch would be sufficient. It may be explained at this point, that what has hitherto been said applies to cast-iron flanged pipes used for steam, to wrought iron or steel pipes with screwed flanges in cast-iron or steel, or brass and copper pipes with flanges of iron other metal, and to steel and wrought-iron pipes with flanges into which the pipe is extended or secured by rivets. No account has been taken of hydraulic pipes, which are usually secured with very heavy oval flanges. For the purpose of comparing the proposed standard with those already in use, diagrams have been prepared, showing the differences in diameters of flanges, and in number of bolts. It will be seen that the present proposals give flanges slightly in excess of those of the American low pressure standard, but that in no case is the variation more than one inch in the outside diameter. The American standard adopts the principle of the multiple of four in arranging the bolt-holes, but four bolts are used for pipes from 2-inch to four inch inclusive, whereas in the proposed standard four bolts are not used for pipes larger than 2½-inch. In respect to pipes above 4-inch in diameter the two standards agree as to the number of bolts, except the 8-inch, 12-inch, 14-inch, and 18-inch pipes, in which cases the American low pressure standard contains four bolts less in each flange. Turning to the high-pressure standard, it will be noted that the diameters of flanges in the present proposals are somewhat smaller than those of the American standards, varying from ¼-inch for three inch pipes to two inch on the 24-inch pipes. There is agreement in the two standards as to the number of bolt holes up to and including the five inch size, and several above that size also agree. Generally speaking, however, the American high-pressure standard contains more bolts for pipes of six inches diameter and upwards; while for 14-inch pipes the American standard has twenty bolts of ⅞ inch diameter, as against 16 bolts of one inch diameter in the proposed standard.

Turning to the German standards, difficulty rises in making an exact comparison, owing to the different systems of measurement; but generally it will be seen that in the German standard the flanges are somewhat smaller in diameter for given size of pipe than those proposed in this paper. The difference is, however, but slight. For instance, a pipe of 150 mm. (or 5 15-16 inch) inside diameter has a flange 300 mm.

(or 11 13-16) diameter, whereas in the proposed standard the flange for a six inch pipe is 12 inch diameter. Unfortunately the sizes of the flanges in the two German standards do not agree, except for pipes up to 80 mm. (or 3 5-32 inch) inside diameter. As for example, the difference in the size of flange on a pipe of 400 mm. for 15¾ in.) inside diameter is but 30 mm. (1 3-16 in.;) and seeing that the amount of material saved by this small difference is so slight, it would appear that, all things considered, it would have been more economic to have made these two sizes agree. As to the number of bolt-holes, the German standard does not agree with the one now proposed, except in few sizes of pipes for the high pressures, and the German low pressure standard is not interchangeable with that for the high pressure. This doubtless saves a few bolts for the low-pressure work, but it is questionable whether as much economy is derived from it as would be obtained from increasing the number of bolts to make them uniform with the high pressure standard. Comparing the proposed standard with those given as being representative of existing English practice, it will be seen that as regards the diameters of flanges but little alteration is suggested, the chief difference being in the number of bolts. So far as can be ascertained, no firm has, up to the present, adopted the multiple of four as a fixed principle. The difficulty in the differing systems of measurement must, of course, be confronted if an effort is made to institute an international standard for flanges, owing to the present English system of measurement. But as already close approximation is made, in many cases, to identity of measurement, it does not seem difficult to arrive at a working compromise by disregarding the vulgar fractions so far as a possible, in the English system, and by departing occasionally from the existing Continental custom of even numbers in millimeters.

It is apparent from the foregoing that, with the continuous expansion of international trade, it is desirable that, if possible, a standard should be adopted which will be applicable at home and abroad. Recognizing the various interests involved, and the many branches of engineering to which this subject is applicable, and considering the advantage of an interchange of ideas with other societies interested in the subject, it would seem essential that any arrangement to secure success should meet the approval of the principal engineering organizations interested.

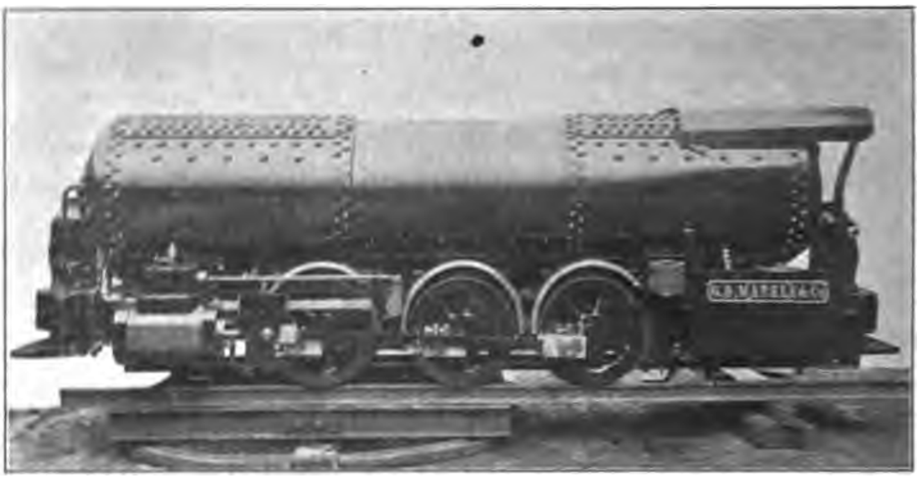
The want of uniformity is equally felt when considering the principal dimensions of these fittings. What has already been said in this respect with regard to flanges will be found applicable also to this branch of the subject; for it is as important to have interchangeable dimensions for fittings as for flanges. At present it is the case that those made by one firm are not of use for replacing those of another firm, should such necessity arise; while in numerous other ways needless to particularize, experience constantly reveals the loss and inconvenience from the existing diversity and confusion in the patterns commonly used. At the present time very few manufacturers keep large stocks from which supplies can be drawn, and it was ascertained, while procuring information relative to existing practice in this country, that wherever a standard had been formulated, it was of purely arbitrary character, and no definite principle had been laid down; indeed, in some instances the same dimensions for bends and tees were adopted for four inch, and even six inch fittings. Again, in constructing a fitting, while a minimum amount of metal should be used, it ought to be consistent with adequate strength, and with proper facility for inserting the bolts and making the joint. Further, it is a matter of common experience that trouble is often caused by the dimensions of bends and tees being too small to allow of easy fixing. In face of these existing disadvantages, therefore, it is but reasonable to urge that the problem should be viewed from considerations of general utility, as well as from the point of view that would first present itself to the manufacturer. An endeavor has also been made to arrive at definite uniformity with respect to these fittings, for which the paper contains a series of standard dimensions.

INDUSTRIAL RAILWAYS.

WALDON FAWCETT.

THE importance of the industrial railway as an adjunct of the large modern manufacturing plant is now recognized universally. With all the advances which have been made of late years in the provision of facilities for the economical handling and transportation of raw or other materials designed for movement from one part of a manufacturing institution to another, there has been designed nothing which entirely takes the place of the private railroad system, usually of narrow gauge, connecting all parts of the establishment. As an indication of the development of these transportation systems it may be noted that in various prominent American manufactories the aggregate length of the private rail lines range from two to 15 miles.

Originally the operative power on most of the industrial railways was furnished by steam locomotives—miniature copies of the regulation locomotives in freight service or else modifications of the switching engines in use on the regular standard gauge railroads,—but latterly compressed air and electric locomotives have been introduced extensively for industrial work and by reason of the economic considerations



H. K. Porter Locomotive for Industrial Railway.

involved these may truthfully be said to constitute the most interesting feature of such systems.

Electric locomotives as the latest innovation are just now receiving the greatest measure of attention. In many respects the electric locomotive is the ideal motive power in shops, foundries and manufacturing establishments where it is desired to move heavy material on narrow gauge cars. Such a machine ordinarily runs with perfect freedom around curves of 12 feet radius and in many instances one man with a single locomotive is enabled to handle all the material of a fair-sized manufacturing plant. The ordinary type of electric locomotive for industrial use is carried on two swiveling eight-wheel trucks with every wheel a driver in order to facilitate the ascent of the heaviest grades. The energy for the daily work is furnished by a storage battery which is recharged at night or at intervals during the day when the locomotive is idle. The principal saving in this type of locomotive results, of course, from the fact that if the locomotive is not at work no power will be wasted. If the locomotive is not in continuous use during the day opportunity will in all likelihood be offered for charging the batteries during regular working hours inasmuch as the recharging requires only one quarter as much time as the locomotive has been in active service since the last re-charging.

The battery on the locomotive is divided into sections which are connected through the controller with the motor armatures and fields in various combinations of series-parallel connections, thus obtaining the different variations of draw-bar pull and speed required for general shop work In order to insure a durability and efficiency of the lead plates equal to that found in batteries used in electric lighting station work, it is customary to use in the electric locomotives unusually large and heavy battery plates in which the margin of strength allowed is such that there will be no danger of over-strain even in starting the load. Two independent electric motors are used either in series or in multiple.

The ability of the ordinary electric locomotive to take a load up almost any required grade is a great advantage where the very common circumstance of a difference in the level in the floor of workshops is encountered. Trolley roads for industrial purposes have been used to some extent and with a fair degree of success but the present disposition is to displace the trolley in favor of the battery owing primarily to the difficulty of placing trolley wires in erecting shops, machine shops and under overhead cranes. The approximate expense for current for the operation of a five ton electric locomotive 13 feet in length and operated on a track of 21½ inches gauge would range from 30 cents to one dollar per working day of ten hours according to the amount of work performed and other considerations. The speed of such a locomotive ranges from one to four miles per hour and the operative of an electric locomotive is supposed under ordinary conditions to do the coupling and more or less of the yard work as well as to keep the switches and tracks in proper condition. In some of the larger institutions in this country storage battery switching locomotives are in use on standard gauge tracks.

Compressed air has decisive advantage over all other forms of mechanical haulage for a large variety of operations. This not only includes use in powder and cotton mills where freedom from danger of fire is essential but also metal working establishments where there is no danger from fire but where something cleanly is desired and electricity is, for one reason or another, not desired. A compressed air haulage plant is, to be sure, rather extensive, including as it does the locomotive, an all-metallic charging station, a stationary reservoir, an air compressor and power for operating the latter. In general machinery such as cylinders, frames, wheels, etc., the compressed air locomotive is very similar to the steam locomotive save that the weight is usually greater. Instead of the usual boiler with its fuel and water accessories is one or more strongly constructed main storage tanks charged with compressed air at high pressure.

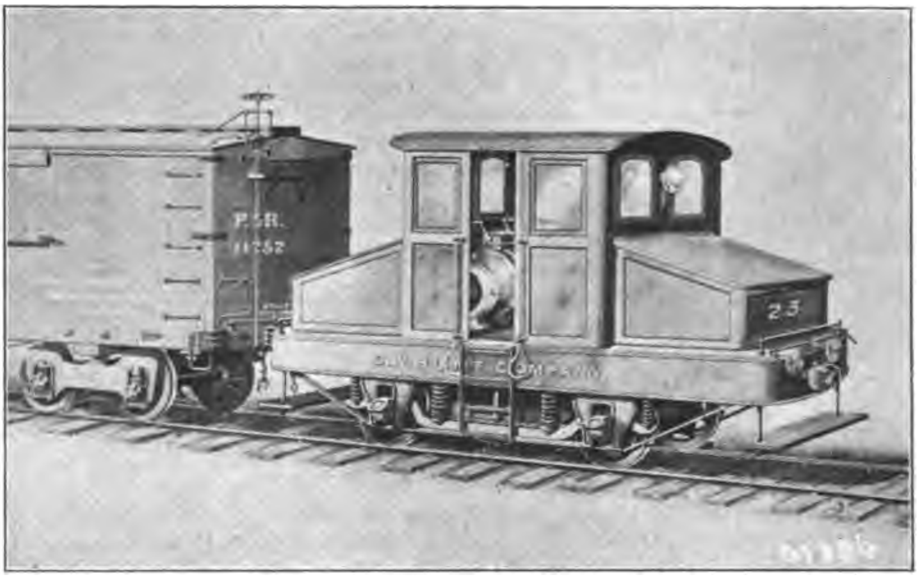
For easy grades, short hauls, and light loads, a storage tank designed for pressure as low as 400 to 500 pounds may prove sufficient but for more severe requirements longer hauls and greater tonnage it is customry to provide locomotives with tanks designed for a working pressure of from 800 to 1,000 pounds and in rare instances it is found advisable to have locomotives carrying a pressure as high as 1,500 to 2,500 pounds. In most instances the charging of compressed air locomotives in use on an industrial railway is accomplished by means of what is known as the stationary reservoir system which is more economical than direct charging since it enables the continuous operation of the compressor at a fairly uniform speed. Compressed air locomotives range in weight from four to 30 tons and have a hauling capacity ranging from 200 to 1,600 tons.

Despite the advances made in the construction of electric and compressed air locomotives there are many fields in which the steam locomotives are yet pre-eminent. One of these is found in that branch of the industrial domain embracing steel works, blast furnaces, reduction works, etc. Locomotives are an essential part of the plant for moving slag, fluid metal, ingots, blooms and other material and iron and steel making plants and the preference for steam locomotives is possibly due in some measure to the fact that such locomotives are usually run 24 hours per day at hard continuous work, exposed to dirt and heat and where stoppage of work means heavy loss. Narrow gauge track is employed almost exclusively and the cars are necessarily hard running. One steel plant in the United States utilizes 50 steam locomotives in this class of service and there are a number of other iron working

establishments in each of which the equipment includes from six to of the locomotives.

A standard form of a narrow gauge track in extensive use is composed of rolled steel rails 21½ inches from outside to outside of rail heads; riveted to cup-shaped steel cross-ties, spaced two feet a part and fitted with four bolt fish plates. The straight sections of track are twenty feet in length and the curved sections 12 feet radius. In the latest type of track the curved sections are so constructed that the outer wheel of the cranes on its flange and the inner wheel on the tread, enabling the standard to turn these curves as easily as farm wagon turns a corner.

The leading manufacturers of rolling stock for industrial railways now provide locomotives and motors for the usual T section of rail, the flat street rail or the wooden rail. For T rails the locomotive wheels are usually made with tread and flange. For flat rails U rails and grooved rails a narrower tread and a shallower flange are used. Wooden rails are only adapted to small sizes of locomotives and for light work,and are not suitable for long continued use. The operating costs of industrial railways is, everything considered, very moderate. From $5 to $6 a day, or $1,500 to $1,800 a year is a reasonable allowance for the operation of a light locomotive that

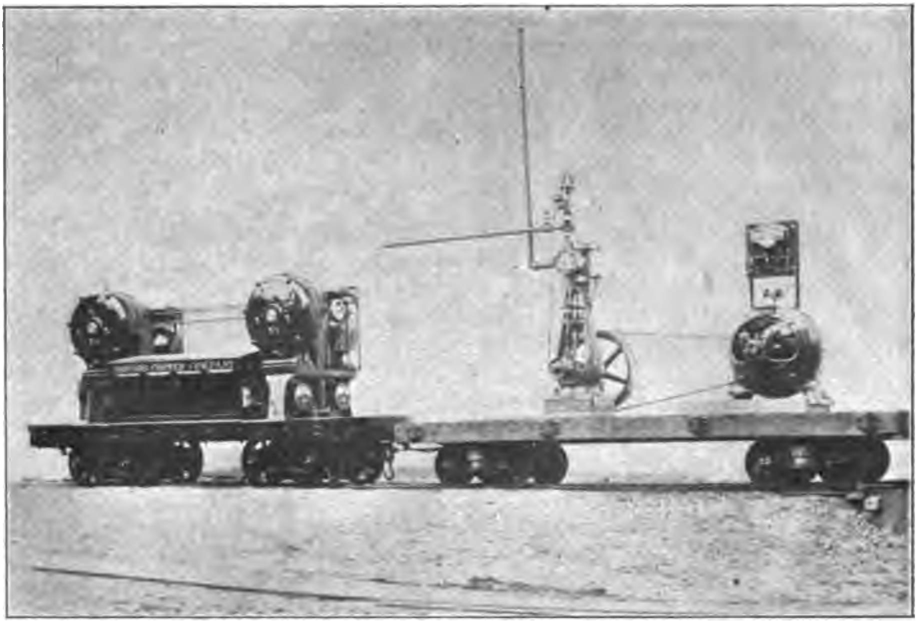


Electric Locomotive, C. W. Hunt Company Type.

will perform the work of from 10 to 40 mules. This estimate provides not only for an engineer but for a boy to switch, couple, etc.

Industrial railway cars embrace an almost endless number of varieties. There are standard flat and gondola cars, ladle cars, self-dumpers, ingot cars, various types of charging cars, compartment cars for scrap metal, coke cars etc. The weight of the eight wheel narrow gauge flat and gondola cars ranges from four to seven tons each and the carrying capacity ranges from ten to 17 tons. An industrial dump car of three cubic yards capacity weighs about two tons.

Separation of Graphite from Pig Iron—Having experimented with five descriptions of pig iron, containing practically the same proportion of total carbon (about 3.3 per cent), and in which the other elements were only present in infinitesimal proportions except silicon—with 0.05, 0.27, 0.8, 1.2, and 2 contents—and not containing (except the last) any notable proportion of graphite, M. Georges Charpy and M. Louis Gernet arrived at the following conclusions, with respect to the separation of graphite by annealing:—1. This separation commences at a temperature so much lower as the silicon content is greater. 2. When once the separation of graphite has commenced it continues at temperatures lower than that at which the reaction began. 3. With constant temperature the separation of the graphite is effected progressively, at a speed so much slighter as the silicon content is slighter and the temperature lower. 4. The graphite content corresponding with equilibrum would appear to be but slightly dependent on the slicon content. 5. The graphite content corresponding with equilibrium increases when the temperature descends; and at low temperatures equilibrium would appear to correspond with the absence of combined carbon.



Electric Locomotive With Charging Set, Built by the C. W. Hunt Company.

Explosive Qualities of Acetylene—Some interesting experiments for the determination of the precise liability of liquid and compressed acetylene to explode, were recently made at Berlin, the plan of operations being as follows: Various cylinders loaded with four kilos of liquid acetylene were placed in position, a valve being at the top, and the gas collected at the upper part of the cylinders being under a pressure of 725 pounds per square inch. A cartridge containing one kilo of picric acid was applied and exploded by electricity, with the result of blowing off the top of the cylinder. The acetylene. however, was not detonated, the cylinder emptying itself on the gaseous acetylene. A second cylinder was charged with three and one half kilos of liquid, a 200 gramme cartridge being placed in the bottom. An electric current was then passed through this, the liquid acetylene exploding and destroying the cylinder. A third cylinder was fired at with a rifle without any resulting explosion, nor was a further cylinder of acetylene disturbed by the explosion of a quantity of picric acid quite near. The conclusion arrived at was that acetylene is undisturbed by sympathetic discharges, but that detonator being in contact therewith, the liquid will invariably explode.

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EDITORIAL COMMENT.

A Matter of Method—The people of McKeesport, having taken alarm at the statement of the general officers of the United States Steel Corporation, and in particular the general officers of the National Tube Company that the concern proposed to remove from McKeesport because of the mental attitude of the people of that city, and especially its mayor, Dr. Black, the officials have made a revision of their former expressed judgement and have decided to "retain" the McKeesport tube works. Those holders of property who wanted a better price for their ground than the United States Steel Corporation felt itself able to pay have decided to retain their interest in McKeesport and demonstrate it by relinquishing their ground to the steel concern to provide means by which the capacity of the works could be enlarged.

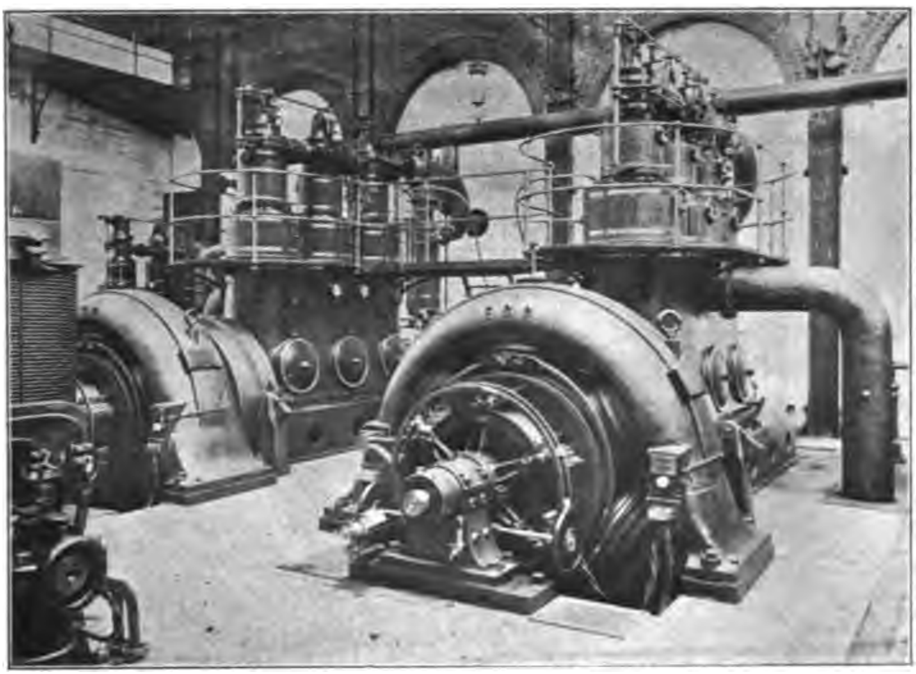
The most recent duplicate of the mailed hand methods come from Wheeling which seems to be in line for a dose of punishment. Wheeling is said to have anarchistic tendencies also and the general offiicers of the United States Steel Corporaion do not feel disposed to invest additional capital in a town that may spout danger at any minute. Whether there is available ground in Wheeling that can not be bought at one price has not become known. If there is and the price changes sufficiently Wheeling may be purged of her anarchistic disposition.

It must be evident to the most careless observer that the iron hand will be a more potent factor in the commercial life of the future than ever and may be likened in some of its aspects to the period when men transacted business with a knotted club. The absorption of outside steel plants and the gathering in of the steel foundries are simply pointers which do not need hand-painted illustrations to indicate the course of the future. But, while predictions may prove vexatious to the prophet, it may be worth while to observe whether or not the present personnel of the official family of the United States Steel Corporation is not broken up, with some of the members standing from under when the operations of the present strenous methods are in full swing.

The Critical Stage—Notwithstanding the fact that consumers are ordering supplies of iron and steel for 1903 delivery, it is not easy to overcome the fear that iron and steel are rushing towards a crisis that may be serious before the time expires during which the iron and steel being freely ordered is to be delivered. At the rate at which the prices of iron and steel are advancing it seems to be a question of time only until the crisis is forced to the front. The conservatism which was relied upon to postpone the day of evil, through judicious distribution, has failed. Values have been reaching out in all directions and while there cannot be said to be a buyers' panic the fact remains that the distribution of supplies has not been so equitable as to hold in check the very forces that must be considered the influence that will precipitate a crisis. The first step in that direction is always the rapid advance in costs. In the present instance it is fair to say that with a better distribution of iron and steel the ruling prices would not exist. But when those very influences that were relied upon, under a definite promise, to maintain the conservative values refused to assist in bringing about a better distribution it was not difficult to see how easy the upward climb of values would be. And the events of the past few weeks show that when one of the influential factors attempts in one motion to maintain relatively low prices on raw material because its contracts for finished steel were at a low figure and, demoralize the supply of raw steel in the market by withholding the normal supply little may be expected but the danger of a crisis. To withdraw raw material from the market and expect prices to hold fast to a conservative basis is so unreasonable that there can be no surprise that the juggling effort failed. And at the rate at which prices are moving to the level of clear excess in values a crisis is the most natural expectation in iron and steel.

Will Soon Make Engines.

One of the most up-to-date engine building plants in the country is rapidly nearing completion by the Bradley Manufacturing Company, of Pittsburg. The works, which are located on Preble avenue, Allegheny, cover an area of 100x 380 feet and consist of a main building, erecting shop, pattern shop, storage house, engine and boiler room, etc. The buildings were constructed by the Bradley company and are of steel structure after designs by Samuel Diescher & Sons, Pittsburg. The Bradley company was organized some months ago to build the Willians central valve engine for the American territory, the main office and works being located at Rugby, Eng., and operated by Messrs. Willans & Robinson, limited. The chief promoters of the Bradley company are C. H. Bradley, Jr., of Pittsburg, D. J. Geary, Oil City, J. H. Bailey, Pittsburg, and others.



The Willans Central Valve Engine. Rights in the United States owned by The Bradley Manufacturing Campany, Pittsburg.

The power plant will consist of a temporary engine until the company is able to build one of its own design, Geary water tube boilers, Bullock generators, dynamos, etc. The machine shop equipment will be furnished by the Brown & Zortman Machinery Company, while Pawling & Harnischfeger, Milwaukee, Wis., will install a six-ton electric traveling crane. All the machinery will be electrically driven.

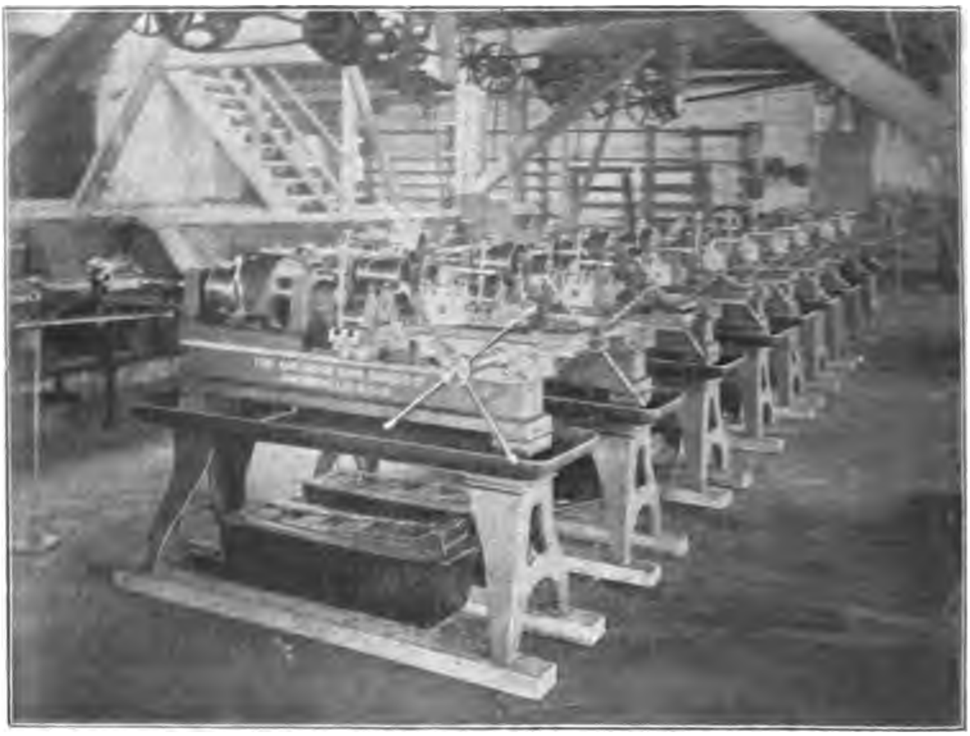
The American rights for the manufacture of the Willans engine were formerly held by the M. C Bullock Manufacturing Company, Chicago, from whom the Bradley company secured all the patterns, fittings, tools, etc. It is the intention of the company to build engines from 50 horse power up to 100 horse power.

The Willans central valve engines are single-acting vertical engines and are made either simple, compound or triple expansion. The piston rod is hollow and contains the valves, which are of the piston type, all mounted upon one rod which is operated by an eccentric mounted upon the crank-pin. The steam enters the hollow piston rod and is admitted to the first cylinder by the movement of the rod and valves and exhausts through the piston rod into the next cylinder. In place of the ordinary cross-head and guides, there is a guide piston; on the up stroke of the engine, air is compressed in the space above this piston and the bottom of the low-pressure cylinder, and thus the pressure in the bearings is never reversed. The great advantage of this is that it insures complete absence of knock and thus reduces wear to a minimum. The work done in compressing the air on the return stroke is nearly all given out again in the next working stroke, so there is practically no loss. The speed is controlled by a shaft governor operating a throttle valve. All working parts of the engine are enclosed.

The Bradley company expects to have its new plant ready for operations within the next thirty days and is pushing the work of building as much as possible.

A Busy Shop.

The accompanying engraving illustrates a tpyical scene in the extensive shops of The American Tool Works Company, of Cincinnati. The facilites which this firm enjoys, in the way of abundance of floor space and so on, have made it possible to devote a large and distinct department of their works to the exclusive construction of each of the different types of machine tools which comprise that linie of manufacture; and in each department these same facilities have enabled the company to follow the policy of building machines in large lots simultaneously, a practice which has its obvious advantages.



Screw Machines Ready for Shipment.

The engraving shows a portion of the works devoted entirely to the construction of screw machines, with the latest lot of No's. 3 and 4 just completed and lined up ready for shipment. The machines in the foreground give a faithful idea of the "American" machine and its manifold improvements, a full description of which can be had at any time from the makers.

The directors of the Illinois Steel Company are discussing plans for the extension of the iron plants which will involve an expenditure of 10,000,000.

Will Leave Connellsville.

Three industries that have contributed materially to the standing of Connellsville are to be moved to Morgantown, W. Va., the result of an offer from the Elkins-Sturgis syndicate.

The plants are the Rolling Mill Company of North America recently incorporated by New York capital under a New Jersey charter, and now in course of construction there; the Iron & Steel Aluminum Coating Company and the Baldwin Automobile Manufacturing Company, which was recently sold to J. C. Kurtz of this place at bankrupt sale. George J. Humbert, who founded South Connellsville is in New York arranging for the transfer. This deal will strip South Connellsville of all its industries except the plant of the American Tin Plate Company. Local capital was largely invested in the automobile factory before its failure and old stockholders, as well as lot purchasers, say they will enter suit to restrain the industries from removing.

The Bostwick Steel Lath Company, of Niles, O., has decided not to move its plant at Warren, but has bought an eight-acre site on the Erie Railroad, just West of Niles. The company will build new buildings and greatly increase its output.

OBITUARY.

ANNIE C. LAUFMAN—Annie C. Laufman, youngest daughter of P. H. Laufman, the first tin plate manufacturer of the United States, now retired, died Monday evening this week at the family home, 309 Oakland avenue. She had been in ill health for a long time and had but recently returned from Southern Pines. N. C., where she had spent the winter in the hope of regaining health.

Personals.

George Forrester, superintendent of the open-hearth department of the Homestead Steel Works, has been selected by the Carnegie Steel Company as the representative of the company to be given a trip to Europe this summer, in return for faithful work. He will be accompanied by Mrs. Forrester and Mr. and Mrs. Joseph E. Schwab, formerly manager of the Duquesne plant. but is now assistant to C. M. Schwab. president of the United States Steel Corporation.

Emil Swensson, consulting and construcing engineer, 925 Frick building, this city, has been appointed consulting engineer to the Rapid Transit Commission appointed some time ago by the Recorder, J. O. Brown, to consider the traction situation and the necessary remedies to relieve the congested condition in this city. The commission consists of Reuden Miller, A, J. Loyan, H. C. Frick, William McConway and J. R. Mellon.

A. H. Swartz, Youngstown, O., has resigned his position as superintendent of steam power at the Ohio works of the National Steel Company, to accept a like position with the Republic Iron & Steel Company, and will have charge of all the boiler plants in the Youngstown district.

Robert A. Cummings, M. A. Soc. C. E., has removed his office from the Girard Building, Philadelphia, to the House building, this city, where he will continue his work as engineer and contractor for masonry, steel and timber structures.

The firm of C. V. Reid & Company was dissolved May 15 by the retirement of James J. Corcoran and John E. Kane. C. V. Reid will continue to conduct the business under the firm name of C. V. Reid & Company.

New Stay Bolt Method.

Up to the present it has been the practice to tap the adjacent sheets of steam boiler by means of a single tap, so that the internal threads of the sheets are practically continuous to each other; but no provision has ever been made for accurately threading the bolt to fit in the apertures since it has been the custom to separately cut the threads on the ends of the bolt. This not only prevents the accurate location of the threads with relation to each other to render them continuous in all cases, but provides interstices transverse to the axial line of the bolt, which are liable to extend still farther into the body of the bolt and eventually separate the ends.

George O. Gridley, of Windsor, has devised a method of manufacturing stay bolts that covers both the bolt and the method of making it. He threads the two ends of the bolt simultaneously, not by cutting, but by compression, compacting the outer surface into a tough and durable skin. This is accomplished by rolling the threads on the bolt between corrugated or threaded plates, so that in the finished bolt the threads at both ends are of the same lead or pitch, and continuous of each other. When the bolt is screwed into the sheets of the boiler the threads on the ends of the bolt accurately register with the internal threads in both the boiler-sheets. By this formation of the bolt, the inventor claims that the liability of the bolt to crack at its juncture with or at a point near the boiler-sheet, is materially reduced, the outer skin being so compressed as to be tough, reducing the danger of fracture. Consequently the escape of steam or the leakage of water from the boiler is more effectually prevented than has been possible with stay-bolts as ordinarily made, for the formation of threads by a cutting operation left an incipient fracture at the base of each thread, which soon opened and permitted the leakage of water and steam.

In each end of the bolt there is also formed a longitudinal aperture, which extends into the middle portion so that in case the bolt cracks there will be a duct for the escape of steam or water for indicating to the engineer the condition of the bolt. Punching is preferable to drilling the hole in the end since the internal wall of the opening is made tougher and more durable and there is less liability to crack than where the hole is drilled, for the drill leaves shoulders from which cracks are apt to start.

To provide for driving the bolts into the openings in the sheets, provision must be made for receiving the wrench. and in forming the bolt, either the aperture which extends into the end of the bolt is squared, that a wrench may be used.

No. 1 blast furnace of the Warwick Iron Company, at Pottstown, Pa., will soon be put in operation.

Japan Needs Machines.

An interesting resume of the trade of the United States with Japan last year is afforded by an extract from "Commercial Relations of 1901," just made public by Frederic Emory, Chief of the Bureau of Foreign Commerce of the State Department.

The inability of cheap labor to compete with machinery, it is stated, is shown in the fact that the greater part of Japan's exports hitherto has consisted of raw materials, while the largest item of manufactured goods has been cotton yarn, which is shipped almost exclusively to China, a country noted, as well as Japan, for its cheap labor.

As the people of Japan come to accept and act on the doctrine—now being taught by her most thoughtful citizens—that her future prosperity depends on the substitution of machinery for cheap labor, she will need to purchase these lines of goods in greatly increased quantities, and the United States should be alert to gain her share of the trade. Already our commerce with Japan, including imports and exports, is greater than that of any other nation. The revival of business in Japan, consequent upon the resumption of traffic with China, will give impetus to railway construction, ship building, and the manufacture of iron and steel, and incidentally to increase the importation of many articles. Inquiry made in Japan as to the relative merits of English and American locomotives proves that, general conditions being equal, the American locomotive is preferred.

Our trade in Formosa is growing. A leading merchant is laying in a large stock of American bicycles, the only stock of wheels in the island, and with the gradual improvemet in roads there is reason to expect a considerable demand.

Coal Land Purchase—George M. Anderson, of this city closed a deal a few days ago for the purchase of 6,000 acres of coal of the Pittsburg seam in the Northern portion of Monroe county, O. The coal property purchased adjoins a recent purchase of 15,000 acres made by J. N. Pew, of Pittsburg, in Monroe and Belmont counties.

Arrangements will be made to develop both of these properties in a short time. The Anderson property will require the sinking of shafts from 60 to 250 feet deep to develop the coal. It is skirted by the line of the Bellaire, Zanesville & Cincinnati Railroad. Near the coal property Mr. Anderson has also closed the leases on 5,000 acres of oil territory. The location is near Jerusalem, in the Northern part of Monroe county.

The New Liggett Plant.

The Liggett Spring & Axle Company, of Allegheny, has closed for 40 acres of land for a plant and 40 acres of coal land on the Monongahela river opposite Monongahela City and will begin work within the next 10 days on the construction of a rolling mill and spring and axle plant. The company has been re-organized with $300,000 capital stock which will be increased to $600,000. C. E. Champ, of St. Louis, president and general manager of the Champ Spring Company, St. Louis, and of the Cincinnati and Hammond Spring Company, with plants at Cincinnati, O., and Hammond, Ind., has been made president and general manager of the Liggett Company. W. E. Marquis remains secretary and treasurer, and with W. G. Park, formerly president of the Liggett Company, and others of this city, form the board of directors. The plans for the new plant provide for a main building 600 x 110 feet, rolling mill 80x300 feet, which will contain two trains of rolls for rolling axle shapes, a turning shop, machine shop, hammer shop, warehouse, and power house. The company will mine its own fuel. Bids on the equipment for the plant and mine will be closed next week. The Allegheny plant will be abandoned upon the completion of the new plant. The product of the plant is springs and axles for vehicles.

Local Concern's Expansion.

The Eagle Foundry & Machine Company, South Canal street, Allegheny, has about completed plans for an extension to its plant to give an increased output of 200 per cent.

The company increased its capital stock to $50,000 and will rebuild the present foundry, enlarging it to 140 x 77 feet. A 77x100 foot machine shop, with a gallery, will also be built. The entire plant will be equipped with the latest improved appliances including two 15 ton electric traveling cranes. The company has at present a 7 ton cupola beside which a 16-ton cupola will be installed. The plant will be so arranged that raw material will be converted into finished product by regular stages without any unnecessary handling. The manufacture of machinery for machine shops is being considered. The plant will be completed by the first of September.

The puddlers and finishers of the bar iron mills will receive no increase in pay for the next two months, as a result of the bi-monthly wage settlement. It was expected that the puddlers would have received 25 cents per ton increase, but the returns showed otherwise.

IN AND ABOUT PITTSBURG.

As was stated in these columns several months ago the Budke Iron & Steel Manufacturing Company, composed of John F. Budke, Canonsburg, and others, will build a sheet mill at Shannopin station. Options have been secured on 157 acres of ground at that place and plans have been prepared for a plant to consist of a main building 100x150 feet; a puddling and knobbling mill 60x200 feet; sheet mill building 113x235 feet and a boiler house 80x100 feet. There will be four stands of finishing rolls, six hot mills, three roughing mills, eight puddling furnaces, eight knobbling fires and one three high bar mill. There will also be installed one 25 ton electric traveling crane, one four ton steam hammer, etc. Among the parties interested with Mr. Budke is B. C. Vaughn, of the Pittsburg & Lake Erie Railroad. The product of the plant will be fine grades of iron and steel for enameling and stamping purposes.

Victor Buetner, Westinghouse building, is engaged in preparing plans for a large open hearth steel plant which is to be built at Canton, O., by a number of parties interested in the Berger Manufacturing Company and the Carnahan Tin Plate Company among whom are Messrs. Langenbach and Carnahan. The plant will consist of three 35 ton furnaces with a 32-inch universal mill. The open hearth building will be 96x280 feet and the rolling mill building 60 x 360 feet, both built of structural steel. There will also be a producer house, boiler and engine room, etc. The universal mill has been secured, it being the one formerly in use at the Graff, Bennett plant. It will be thoroughly remodeled and put in the best of shape. The works will be so arranged that they can be duplicated at any time.

Applications are to be made June 6 for two charters for companies being organized by the subsidiary interests of the Crucible Steel Company of America. One is for the St. Clair Limestone Company, which will operate the limestone quarries of the corporation for the use of the big furnaces that are now being completed. The second the Clairton Steel Company, and will operate the finishing mills of the general corporation. With the corporate existence of these two companies established, the St. Clair properties of the Crucible company will be subdivided among four individual companies. the St. Clair Steel Company, the St. Clair Furnace Company, the St. Clair Limestone Company, and the Clairton Steel Company The stock of all of these companies will be own entirely by the Crucible company.

An application for a charter has been made by the Empire Chain Company, this city, with a nominal capital of $1,000. The company is building a 40 x 90 foot plant in the rear of Smallman street, near Twenty-ninth, this city, which will be ready for operation in two weeks. The company will manufacture chain by machinery up to ⅞ inch; heavier chain will be made by hand. The equipment will include a 25 horse power Bessemer gas engine, six Standish hammers, with furnaces, a link winder, link cutter and a Riehle testing machine. The incorporators are Joseph F. Sehn, William G. McKenney and A. L. Over, all of this city. A meeting of the company will be held May 25 and a premanent organization effected.

The West Penn Construction Company, recently incorporated, will make application for a change in name to the Lucius Construction Company with $10,000 capital stock. The offices of the company are in the House building, this city. W. W. Lucius is president, and E. C. Lucius secretary and treasurer. The company has been awarded the contract to build the bridge over the Monongahela river at Clairton for the St. Clair Steel Company and will begin work this week on the construction of a 2,500 foot bridge at Marietta. O., for the Marietta Bridge Company, which will have a 680 foot cantilever span.

The Dowerman Rivet & Bolt Manufacturing Company, recently incorporated, put its plant at Thirty-second street and Penn avenue, this city, in partial operation this week. The company has installed an automatic riveting machine to manufacture rivets up to 1⅛ inch in diameter and 5 inches in length, and is preparing to install more machines in the near future. The daily output of each machine will average four tons. The plant is equipped with the latest improved appliances. A specialty will be made of low carbon open-hearth rivets.

The Tranter, Davison Manufacturing Company, of this city, sales agents for the Warren gas engine, made by Struthers, Wells & Company, Warren, Pa., have recently sold a 180 horse power double cylinder gas engine to be installed in a water works plant near this city. Sales have also been made of a 35 and an 80 horsepower double cylinder engines for electric lighting purposes; one 65 horse power, four 30 horse power, two 25 horse power and a number of smaller sizes for power plants.

Messrs. F. B. & J. H. McFeeley, of this city, who are operating a silica brick plant at Latrobe, have placed contracts for the enlarge-

ment of its works which will give them an increased capacity. Another eight foot grinding pan, made by Phillips & McLaren, of this city, will be installed and several new kilns will be built. The new addition will be ready for operation by July 1 and will give the works a capacity of about 15,000 brick per day.

The American Nut & Bolt Fastener Company, recently organized, has begun work upon its plant near Brushton which will be ready for operation by June 1. The company will manufacture a fastener to be used on nuts and bolts, the invention of Milton Bartley. The company is composed of Milton Bartley, president; George W. Miller, vice president; E. M. White, secretary; and Barton Grubbs, treasurer, who with S. E. Moore, David Winters, and L. E. Love form the directorate. The headquarters of the company are in the Frick building.

The movement to establish a sheet mill at Shannopin station, on the Pittsburg & Lake Erie Railroad by Senator John F. Budke, of Canonsburg, and others is now assuming definite shape. A meeting of the interested parties will be held in this city this week when stock will be subscribed to the extent of $850,000. It is the intention of the promoters to build a six-mill sheet plant.

The Payroll Computer Manufacturing Company has been organized, in this city, by C. A. Verner, Frank L. Fleishman and H. G. Wasson to manufacture payroll computing machines the invention of Frank Fleishman. The company was granted a charter last Monday with a nominal capital of $1,000. For the present the company will have the machines made by outside parties but will eventually build its own plant.

George Hamilton, 74 Wall street, New York city, Harry I. Riley, and Smith H. Shannon, of this city, will apply for papers of incorporation for the American Steel Tea Chest Company, May 29. The incorporators with J. I. Buchanan and others of this city, who are stockholders will form a permanent organization this month and prepare for the manufacture of steel tea chests.

The Allegheny Steel Band Company, No. 5 Madison avenue, Allegheny, has bought a plot of ground, 100x103 feet on Main street Allegheny, upon which a plant will be built for the manufacture of shingle, heading and box bands and possibly other articles of iron and steel. The present plant of the company will be continued in operation in conjunction with the new plant. J. W. Bowman is president of the company.

A meeting of the recently organized Keystone Valve & Manufacturing Company was held in the offices of McKay and Riley, Carson street, South Side, last week and a permanent organization effected with J. D. Riley as president and William A. Larimer, secretary and treasurer who together with Stephen McKay and M. P. Schooley form the board of directors. A committee was appointed to secure a site upon which to locate a plant.

The stockholders of the Pittsburg Stove & Range Company, of this city, held a meeting on Monday last and voted to sell the property of the branches located at Monongahela City and Sharpsburg. The Allegheny plants and those located at other points will also be abandoned in the near future. These will be sold as soon as the new plant is built at Beaver Falls, where the company proposes to concentrate its business.

James E. McNary, Empire building has taken the contract to furnish the Carnegie Sheet Steel Company, Carnegie, with three Hamilton-Corliss engines made by the Hooven, Owens & Rentschler Company, Hamilton, O. Mr. McNary has also accepted the sales agency of the Burt Manufacturing Company, Akron, O., for the sale of the Burt oil filter and the Burt exhaust heads.

NOTES OF THE INDURTRIES.

The United States Coal & Coke Company, Welsh, W. Va., has decided on locations for eight mines and 1,200 coke ovens in the Tug river district. A ten-mile branch railroad is being built from Welsh to the new field. Coke making will be begun in December and the initial output is to be 3,000 tons a day. The United States Coal & Coke Company is a subsidiary company of the United States Steel Corporation. The H. C. Frick Coke Company will distribute its product. The plant will give the Ohio and Chicago steel plants of the corporation a plentiful supply of coke with a shorter railroad haul than is now necessary.

Frank C. Roberts & Company, Philadelphia, have contracts for the erection of ten new blast furnaces to be built in England and Wales. Four will be erected at Cardiff, Wales; two at Black Hills, England, and four at Middlesboro, England. The company has about five years work in England.

The Ohio Solid Steel Company, Cleveland, O., which was recently incorporated under the laws of New Jersey will build its plant in one of the

suburbs of Cleveland and will employ about 350 men in its mechanical departments. The plans for the buildings are now in the hands of the secretary of the company, Charles A. Parsons, and as soon as the land for the site contemplated is purchased the work of construction will be begun so that the plant will be in operation some time this fall.

The Carteret furnace at Hackettstown, N. J., has been leased by the New Iron & Steel Company, a newly incorporated company, and Superintendent Luther states that the plant will be in operation within a fortnight. The new concern is composed of Mr. Luther and two capitalists, one for Buffalo and the other from Philadelphia. They have leased the plant from Receiver John S. Gibson, of Newark.

Officials of the United Gas Improvement Company, Philadelphia, states that negotiations are pending to secure possession of the principal street railways and the electric lighting and gas plants of Providence, R. I. The companies being negotiated for are the Union Traction, the Narragansett Electric Lighting and the Providence Gas Companies. The amount involved in the deal is $16,000,000.

The Globe Rolling Mill Company of Cincinnati, which has been doing business under a partnership agreement between J. L. Adams and Thomas H. Carruthers has been incorporated as a stock company. The board of directors will consist of Adams, Carruthers, Levy D. York, W. F. Vosmer, and John E. Bruce. The capital stock of the company is placed at $200,000.

Arrangements are being made by the Stewart Iron Company, Sharon, Pa., for the erection of a plant for the manufacture of cement from furnace slag. This will be the first plant of the kind in that valley, but it is said that several other furnace companies are figuring on erecting plants.

The Lunkenheimer Company, Cincinnati, has bought ground in Fairmount adjoining the building the company has almost ready for occupancy. The additional property is 122 by 142 feet. Bert L. Baldwin has drawn plans for a new building, pressed brick, with stone trimmings, for offices.

Work will progress rapidly on the new office buildings of the Cincinnati Gas & Electric Company, McFarland & Plum streets, and the new addition to the Edison plant on the canal. The contract for the iron work in the office building has been let to the Stewart Iron Works,.

The Gloucester Iron Works, Gloucester, N. J., held its annual meeting a few days since and elected the following directors: Samuel Shipley, James E. Hayes, David D. S. B. Chew, John R. McIntyre, and Henry B. Chew.

The Chicago Pneumatic Tool Company reports as many orders during the first two weeks of this month as in any entire month since the Company began business. Three is a noticeable increase in orders for the Chicago pneumatic tools from Germany, France and Great Britain.

The structural iron workers in Youngstown announce that they will not accept the compromise of 47½ cents offered by the American Bridge company, as did the men in the Pittsburg district. They will stand for 50 cents per hour and an eight-hour day.

At a meeting of the stockholders of the Youngstown Manufacturing Company, Youngstown, O., the following officers were chosen: President, Edwin McEwen, vice president, S. B. E. McVay, secretary and treasurer, Whitney Warner.

C. A. Sims & Company, Johnstown, Pa., are preparing the ground at Mt. Union, Huntingdon County, Pa., for the erection of three more large double kilns for the Harbison-Walker Company, of Pittsburg, the well-known fire-brick manufacturers.

Roydhouse, Arey & Company, Philadelphia, will build a large truck manufacturing shop, to be built at Eighteenth and Buttonwood streets for the Baldwin Locomotive Works. It will be a three-story brick structure 17x72 feet and will cost $75,000.

William Steele & Sons, Philadelphia, will build a two story machine shop, 39 by 92 feet, on Lippincott street, below Twenty-first, for the Quaker City Electric Company. It will cost $10,000.

The Cuyahoga rod mill is to be removed from Cuyahoga Falls, O., to New Castle, Pa., at an early date, according to the announcement of E. A. Henry, of New York, general manager of the concern.

Proposals for furnishing and attaching fixtures for lighting the New Municipal Building of Johnstown, Pa., will be received a the office of the City Clerk until the 28th inst.

Engineers are now engaged in surveying ground preparatory to starting the work of erecting a structural iron plant at Haselton, O., by the Republic Iron & Steel Company.

The Ajax Metal Company, Philadelphia, has awarded a contract for building an addition to its plant, 62x247 feet in size.

The Acme Machinery Company, Cleveland, O., will erect an addition to its plant together with an office buliding.

The new structural works of Shoemaker & Company, at Pottstown, Pa., was put in operation last week.

NOTES F THE SOUTH.

J. M. Elliottt, president of the Southern Car & Foundry Company, and associates have obtained a charter from the secretary of state of Alabama for the Alabama, Tennessee & Mississippi Railroad. The railroad is to penetrate iron deposits at Greasy Cove twenty miles from Anniston and heretofore remote from any railroad. Parties connected with the company have also bought the old charcoal furnace at Gadsden and will put it in operation again. The Car & Foundry Company recently purchased the car plant of the Illinois Car & Equipment Company at Anniston, which it had been operating under a lease for several years, and is now going out for raw materials at first hands. A number of improvements have been added to the Anniston plant and it has become one ofthe largest and most perfect in the country. The company has completed grading for the pressed steel car works at Wylam near Birmingham and it is understood that this proposed plant will now be built.

April was an active month in metal movements from the Southern field. Pig iron movements from Alabama and Tennessee were 145,261 tons, water pipe 17,821 tons; from the Birmingham district 78,329 tons of pig iron and 7,883 tons of pipe; from the Anniston district 19,487 tons of pig iron and 4,379 tons of pipe; from Nashville 6,578 tons of iron; from Middlesboro 3,995 tons of iron; from Chattanooga 21,457 tons ofiron and 5,559 tons of pipe; from Sheffield 15,413 tons of pig iron. Exported 149 tons of pig iron and 592 tons of pipe; steel shipments from Ensley 8,324 tons.

The following resignations will take place in the force at the steel mill of the Tennessee Company at Ensley June 1. John M. McConnell, general superintendent; T. H. McNamee, superintendent of the blooming mill; Harry Barth, superintendent of the open hearth furnaces: Thomas J. McNamee, night superintendent of the blooming mill; and John Jones, master mechanic. No cause for the resignations is given. Mr. McConnell came from Pittsburg and succeeded W. R. Palmer about a year ago. A Mr. McDonald is to succeed Mr. McConnell.

There is no longer any doubt of developments on the part of the Alabama Steel & Wire Company on the recent purchases of coal lands near Bessemer and iron ore lands in Cherokee county. Coal mines are already being opened and two blast furnaces and a steel mill are promised.

It is generally conceded that the Woodward Iron Company will in the near future build a third furnace at Woodward, Ala. This plant has been the most successful financially in the South.

The Virginia-Carolina Chemical Company during the past week absorbed two fertilizer plants at Montgomery and the plants at Opelika and Dothan. The leading directors of the company are touring Alabama and Mississippi and picking up plants at many points. Probably a dozen more factories will have been added to the listing in the next few days.

The Birmingham Ore Company, of which W. G. Robinson is president, has bought the Hilsdale Coal Company's eight acres of coal land in Jefferson county for $20,000.

The Alabama Car Service Association handled during the month of Aprril 50,632 cars against 41,127 cars the same month a year ago.

WEST VIRGINIA NOTES.

Col. Charles H. Headley, of Grafton, has sold to Pittsburg, Canton, and Cincinnati investors 5,000 acres of coal in Randolph county. The papers closing the deal are being drawn by McGraw & Post, of Grafton, and until they are filed they will not announce the names. It is known, however, that $1,000,000 is involved, and that a branch railroad with two big mining plants will soon be built.

Stephen B. Elkins, ex-Senator Henry G. Davis, Arthur Lee, C. S. Robb, and C. M. Hendley, have organized the Coal & Coke road of West Virginia and will build a road from Elkins in Randolph county to Glenville, in Gilmer county. The company intends to develop coal property and will operate with a capital of $5,000,000.

The South Penn Oil Company, has a force of men at work near Philippi, W. Va., taking up coal land. It is announced that the company for the first time in the history of its operations in this state will open up coal land and coke ovens.

The High Grade Shale & Brick Company, of Clarksburg, has elected Dr. Fleming Howell, president; W. B. Maxwell, secretary; T. M. Jackson, Dr. Howell, W. B. Maxwell, S. F. Reed, and C. M. Hart, directors.

Harrv Northwood and Thomas Dugan have begun work on remodeling the Hobbs works of the United States Glass Company, at Wheeling, and will install machinery to equip it for manufacture of specialtes.

Pittsburg men whose identity is thus far unknown have secured of John W. Brown at Wilsonburg, a plot of land for a lamp-black and carbon plant in which $20,000, approximately, will be invested.

W. J. Conoway, E. T. Tetrick. W. E. Tetrick, J. F. McEntire, and H. C. Michael, all of Enterprise have organized the Enterprise Conoway Coal Company and will open mines at once.

Twelve new companies with a capital of $35,000,000 entered the West Virginia coal field the past year according to the report of State Labor Commissioner I. V. Barton.

The A. C. Free Company, of Mannington, has been chartered by the secretary of state, capital $10,000, for general merchandise and machinery purposes.

The Eagle Glass factory burned at Wellsburg will be rebuilt at a cost of $100,000.

Fire Brick Consolidation.

The much talked of consolidation of many of the high grade fire and silica brick manufacturers of the state of Pennsylvnia has been accomplished. Application will be made under the state laws of New Jersey for the incorporation of the American Refractories Company, with a capital of $22,500,000 which is to have its headquarters in Pittsburg.

The companies to be controlled by the newly formed organization consist of the Harbison Walker Company, Isaac Reese & Sons Company, Pittsburg; Phillipsburg Fire Brick Company, Philipsburg; Basic Brick Company, Johnstown; Clearfield Fire Brick Company, Clearfield; Wallaceton Fire Brick Company, Wallaceton; Clinton County Fire Brick Company, Mill Hall; Fredericks, Munroe & Company, Farrandsville; American Fire Brick Company, Lock Haven, and the Layton plant of the Fayette Manufacturing Company. In all there will be 15 directors which will include the following: H. F. Bigler, Clearfield; F. H. Wigton of the Phillipsburg Company of Philapelhia; H. C. Croft, S. C. Walker and S. P. Walker of the Harbison-Walker Company; George Reese, R. W. Frederick, Alexander Paterson of the Wallaceton Company; Moore Fredericks of Clearfield county; F. H. Seeley of Altoona. of the Basic Brick Company; two directors to represent the New York end of the underwriting syndicate and two to represent the Chicgao end.

The consolidation was engineered by T. L. Claybourne, Jr., of New York assisted by several Chicago financial men. The capital will be divided into approximately $8,000,000 of 6 per cent cumulative preferred stock, and $14,500,000 of common shares. The American Refractories Company will issue or guarantee about $3,500,000 of 5 per cent gold bonds which will be used in part for refunding outstanding issues. The company will effect enormous savings in manufacturing and selling. The securities outside of those to be taken by the manufacturers have been underwritten by a syndicate represented by Mr. Chadbourne. The company will be launched with a working capital of nearly $2,000,000. The individual manufacturers will participate heavily in the stock holding and the management will be placed entirely in their hands

Steel Capacity Increased.

The Allegheny Steel & Iron Company has just completed a second open-hearth steel furnace in its plant at Avenue, and will put it in operation within the next two weeks. The new furnace is a duplicate of the one which has been in operation since last summer, and has a capacity of 50 tons per heat, or about 600 tons a week. The annual output of the two furnaces will be about 50,000 tons of ingots. For two weeks past the new furnace has been undergoing the process of drying out by means of natural gas flames distributed throughout the interior. The building is not entirely completed, the putting on of the final touches having been delayed by the strike of structural iron workers, but this will not interfere with the starting of the furnace when it has been dried out, as the cranes are being set up and put in operation by the regular mill labor.

In connection with the new steel furnace the company is increasing its capacity for rolling ingots into billets and sheet bars. When all the additions are running to full capacity the plant will have an output of 50,000 tons basic open-hearth steel ingots, or 40,000 tons of billets and sheet bars.

The plant of the Allegheny Steel & Iron Company was first put in operation in July last. With the furnace just completed the company will have two 50-ton basic open hearth furnaces, which will be able to turn out 200 tons of ingots a day. The bar mill is being increased in capacity by the addition of another stand of rolls, by which it will be able to take care of the increased ingot production. The sheet mill, however, has not been enlarged, as the company prefers to have a surplus of steel, which can readily be sold in the open market.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The continued buying of iron and steel for delivery during the first quarter of 1903 remains the feature of the stiuation. The buying is not widespread of course nor so extensive as the buying for the later months of this year but is sufficient to make an impression upon the markets. As stated, before, however, the business offered for next year's early delivery does not stand alone but is always a part of contracts which as a rule begin with July this year and run through the succeeding nine months. The number of contracts that are to run through nine months is much higher than since 1899 if indeed there were so many long forward orders at that busy time.

Prices are still headed toward the top of the schedule and the effort to control the values will be full of interest for all observers. Up to date the effort seems to have been only weakly successful and even the United States Steel Corporation has been compelled to keep step in the march towards a higher level of values in all products of iron and steel. Today there seems scarcely to be a limit to the distance which the advances will move before the halt is forced by the refusal of consumers to offer business.

This week's business at the merchant blast furnaces of the valleys was on a basis of $21 per ton for Bessemer pig for delivery within 60 days; $20.50 for delivery during the last six months of the year. Bessemer billets may be mentioned, hardly more than that, at $35 to $36 per ton at Pittsburg mill. Mill iron is as firm as any of the more favorable materials at $20.75 at furnace which seems to be an extraordinary price for that product.

In the finished steel lines there is nothing of feature that is new. The mills are engaged in attempting to meet their obligations with considerable success but all are far in arrears with shipments. No new prices have been named although there is a promise that some of the lighter finished steel materials will go out at higher rates within the next 30 days.

CURRENT QUOTATIONS:

Basic	$20 25		Splice bars	1 50	
Bessemer		21 75	Angles	1 60	
Charcoal, hot	32 00		I beams	1 60	
Charcoal, cold	32 50		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 70
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	36 00		No. 1 cast	17 00	17 50
Open hearth	35 00		Iron rails	25 00	24 00
Steel bars	1 80		Car wheels	18 00	19 00
Iron bars, refined		2 00	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	2 90	
Bolts, iron, sq nut	2 50		Sheets, 27	3 00	
Hex nuts	2 65		Sheets, 28	3 10	
Spikes	2 00				

Philadelphia—There is no change in conditions of the iron and steel markets, and the same activity and scarcity of products, of which so much has already been said, continues. Premiums are being paid right along for pig iron, billets, and much bar and skelp, and the fact that pig iron and steel are so scarce is doing very much to sustain the market on finished products. There is very little new business being transacted in either pig iron or billets, as buyers are pretty well covered, and, on the other hand, there is very little of either to be had. Some foreign iron and steel is coming in. Sales aggregating about 10,000 tons of billets and sheet bar having recently been made, the greater part of which is for the Central West. In the East the trade is embarrassed somewhat by the strikes in the Lebanon district and at Reading. Should the anthracite coal miners strike there will undoubtedly be an iron famine in this section of the country, for the furnaces are carrying practically no stocks and the yards of consumers are mostly bare.

As compared with a week ago, the local pig iron market has gained still further in firmness, and the continued difficulty of commanding prompt deliveries has stiffened prices to some extent. At the present time the shortage is the dominating feature, and it is especially effective because of the unprecendented exhaustion of stocks. All grades of iron are equally scarce, and it naturally follows that prices are irregular. In a general way they are about as follows for Philadelphia and nearby points, with 50 to 75 cents additional for May, June and July shipments: No. 1 foundry, $20.50 to $21.50; No. 2 foundry, $19.75 to $20.50; gray forge, $19.25 to $19.75.

There is very little doing in domestic steel billets, but a good deal of foreign is being offered. It is stated that the latter can be had at about $30 to $30.50, ex-ship, but buyers do not appear to be particularly anxious to bid for it unless for immediate shipment.

All finished iron and steel products are getting scarcer, and prices are much higher than the official quotations, being graduated according to the time fixed for shipments. Labor troubles at some of the leading mills in the East are liable to make a considerable shortage in bar iron. Structural material is getting scarcer every day, and the mills are unable to meet the demand. Considerable business has been placed abroad, but shipments are overdone and in many cases disappointing. The demand for sheets continues good, and prices are very firm but unchanged. There is considerable agitation to advance the price of plates, but this will likely be opposed by

some of the leading makers, who insist upon a conservative policy in the matter of prices, fearing that if the market gets too high it will curtail the demand, which is now very satisfactory.

CURRENT QUOTATIONS:

Foundry, 1	$20 50	21 50	Girder rails	32 00	32 50
Foundry, 2	19 75	20 50	Angles, 3" & lr'gr		1 80
Gray Forge	18 25	18 50	Under 3-inch		1 90
Bessemer billets		33 50	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown & Company—Every feature of the market continues without change. The long contracts for this year's delivery have been mainly closed, and there is very little buying for 1903. The current demand, therefore, is for spot or early delivery iron, and substantial premiums are made to secure this. Consumption is maintained at full tide. Production, as shown by April statistics, has increased moderately, the rate of output having for the first time in our history touched 18,000,000 ton. Stocks have practically disappeared, being down to about 60,000 tons at all the merchant furnaces in the United States. It has not been uncommon in the past for single companies to carry more iron than this. Importations go on quietly, but in considerable volume, to supply the Eastern seaboard requirements. Steel billets and bars and structural forms are also being brought in for deliveries to mills in Philadelpnia and as far West as Pittbsurg.

There are no changes in prices, which are firm all along the line. It is not thought that the advance movement will go further, for prices in Eastern markets are now about on an even basis with English, Scotch and German irons.

CURRENT QUOTATIONS:

No. IX fdy Nohn Jersey City	$22 50	21 50	Angles	2 00	2 50
No. 2X fdy Jersey City	20 65	21 00	Tees	2 00	2 50
No. 2 plain Jer. C.	19 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	22 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	21 00		Com. base, bars per 100 lbs	1 65	1 70
No. 3 fdy N. Y.	20 50		Refined base, bars	1 85	1 90
No. 1 soft	17 75		Bands, base	2 40	2 50
No. 2 soft	18 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

Chicago—The blast furnace at Milwaukee recently started up is said to have no contracts booked and its output therefore goes directly to supply the current car load business, an aid of considerable value in the present straightened state of supply. A local pig iron man who has just returned from a visit in the East says the scarcity of pig iron there is more severe than in the Chicago district. However, very little spot iron is for sale here. The tone of the market is strong and prices for immediate shipment are a dollar or two above the quotations for shipments during the last quarter of the year. There is an improved inquiry for deliveries of the later sort.

General inquiry is not quite so brisk. One explantion is that the coal strike is exerting a temporary effect upon the trade sympathetically. But a lulling effect is not an evil, with demand in its present excessive proportions. There continues a fair amount of buying for shipment during the first quarter of 1903. Plates are very scarce and prices out of store are advanced about $2 per ton. Bars are selling in small lots principally but prices are firm. Some inquiry for standard rails for early 1903 shipment is reported. Structural material also continues to be sold for that distant delivery.

The cheaper grades of scrap are quite scarce, the better grades are offered more freely by the railroads. Values are practically unchanged. Buying is limited, consumers taking offerings at unchanged prices but declining to pay a higher range.

CURRENT QUOTATIONS:

Bessemer	22 00	23 00	Sheets, 26 store	3 25	3 40
Fdry Nohn 1	21 50	22 50	No. 27	3 35	3 50
Northern 2	21 00	22 00	No. 28	3 45	3 60
Northern 3	20 50	21 50	Angles	1 75	
Southern 1	20 65	21 65	Beams	1 75	
Southern 2	20 15	21 15	Tees	1 80	
Southern 3	19 65	20 65	Zees	1 75	
Forge	19 15	20 15	Channels	1 75	
Charcoal	22 00	23 00	Steel melt'g scrap	18 00	18 50
Billets, Bessemer	34 00	36 00	No. 1 r.r. wrought	20 50	21 00
Bars, iron	1 85	1 95	No. 1 cast, net ton	15 50	16 00
Bars, steel	1 75	1 85	Iron rails	24 00	25 00
Rails, standard	28 00		Car wheels	20 00	21 00
Rails, light	34 00	40 00	Cast borings	9 50	10 00
Plates, boiler	1 90	2 00	Turnings	13 50	14 00
Tank	1 75	1 80			

Cincinnati—The new prices went into effect last week, and on the basis of $16.00 Birmingham, about 1,000 tons of pig iron were sold in this market. The most of this was for delivery during the last half of the year. May and June shipment demand is greater than the supply. Sales have been made for delivery during the entire year of 1903. There has been considerable pig iron sold for delivery from July to December, the furnaces accepting contracts freely for this period at the higher prices that have been established. Consumers though who have been in the market for immediate shipments have had difficulty in obtaining supplies, owing to the scarcity of iron, as it has been claimed that 90 per cent of the product of the Southern furnaces for this year has been sold.

The only iron at the present time available for spot sales are the little odd lots which are made from time to time, and which do not happen to fit existing orders. The tonnage of this kind of metal is necessarily inconsiderable.

Interest in the situation centers in the last half of the year. The great majority of consumers are well covered for all of 1902. There are of course some consumers which later on will be needing iron, and they are anxious as to where they are to secure their supply.

Steel billets are very hard to get at any price. Makers name $33 to $33.50 but they are sold so far ahead that they are not taking on any new business.

CURRENT QUOTATIONS:

South. fdy. 1	19 25	$19 50	Standard Sections	29 90	30 90
South fdy. 2	18 75	19 00	Sheet, 26	3 40	
South. fdy. 3	18 25	18 50	Sheets, 27	3 50	
South. fdy. 4	17 75	18 00	Sheets, 28	3 60	
Grey forge	17 75	18 00	Angles, 3 to 6 in	1 70	
Mottled	17 75	18 00	Angles, 1¼ to 2½	1 82	
Shn. 1, soft	19 25	19 50	Beams and Chanl 15 in and under	1 70	
Shn 2, soft	18 75	19 00	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	22 00	22 50	Tees	1 75	
L. Superior, 2	21 00	21 50	Z's	1 70	
L. Sup'r char'l c w	22 00	23 00	1 wrought scrap	19 00	20 00
Hang'g r'k col, 1	26 00	28 00	Steel mlting stock gross ton	16 00	
Sou'n col'd w	20 35	20 60	No. 1 cast	18 00	
Jaks'n cy. silv'y 1	21 50	22 00	Old iron rails g t'n	22 00	
St'l br's base hlf ex	1 72		Old car wheels	20 00	
Iron bars	1 82		Cast borings	6 50	9 00
Flange plates	1 80		Turnings	12 00	
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

Birmingham.—The Southern iron market, so far as spot iron is concerned, has broken completely from its moorings and the makers who have iron for immediate delivery to spare are charging from $16.50 to $17.50 for No. 2 foundry. Several sales of 500 to 800 tons have been made at the latter figure. J. C. Maben, president of the Sloss-Sheffield Steel & Iron Company, was the first large operator to break away from the $12 basis for No. 2. He has announced that he will sell No. 2 at $16 per ton and he probably gets more than that when he has iron to spare. The tendency is still higher. Indeed $20 iron seems to be in sight.

The conservative tendency has for the present at least been done away with and the operators are getting all they can. The resistance of the tendency to advance was longer and more obstinate than ever before recorded in the South. In fact, up to the agreement to hold down prices made some months ago the Southern operators, have as a rule, charged the maximum price the market would allow. The larger operators are out of the market for some time yet. What they will charge when they book orders for the first quarter of next year is the interesting problem. General surmise is that $16 for No. 2 will probably be this basis.

The water and soil pipe factories have all they can attend to and are, in fact, declining some orders. Shipments of metal are quite heavy. The steel plant of the Tennessee Coal, Iron & Railroad Company at Ensley is in better form than it has ever been and is making and selling more steel than it ever did. The trend of development in the Alabama coal fields is very marked, large purchases of coal lands occurring several times each week and each purchase is followed by the opening of new mines. All the raw material that can be secured is needed and much more besides, hence this development is of a very healthy nature.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$17 00	18 50	Tank	1 80	
No. 2 fdy, Sohn	16 50	17 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	16 00	15 50	No. 1 wrought	14 00	
Grey forge, Sohn	15 50	16 00	No. 1 cast	12 00	
Billets	28 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	3 10	3 50
Fire box	2 00				

Coal.

Pittsburg—The slowness of the movement of coal to the lake docks is still the feature of the fuel situation. The mines are hampered in their productive ability by the slimness of the car movement lakeward and until there is a better adjustment of the case at Cleveland and other leading lake points the mining situation in the Pittsburg district will not experience much of a boom. The supply of local fuel is abundant, one of the few good points in an otherwise unfavorable case.

Cleveland—The coal trade still holds the attention of the vessel owners and shippers. From the standpoint of the shipper it has been a distressing week. Receipts have been lagging continually and the bright promises of the railroad men to furnish more equipment for the movement to the lakes have amounted to almost nothing. It is reported that the receipts have been no more than a quarter of the requirements. This is in part confirmed by the statements of the railroad officials that they have been unable to send enough cars to the lakes to take care of the coal trade. The outlook for an improvement is not encouraging, since a better demand for bituminuous coal in the East, to take the place of the anthracite, which will be short in account of the strike, does not promise well for any immediate increase in the equipment available for lake shipments.

At the pace the material is being moved up the lakes shippers are able to meet the immediate requirements of the trade, but are able to add little or nothing to the stocks on the upper lake docks. A continuance of this speed of shipment will mean a rush later in the summer which is not at all inviting to the shippers, as it means

a vast movement of coal in a crowded season and an increase in the rates of carriage that will entirely offset the advantage of a long season. Whether this will be detracted from by the lack of hard coal is an unsolved question, but it is hardly likely. In the meantime the vessel owners are contenting themselves with numerous loads for small boats and are sending their larger boats up the lakes light, taking the strike in the anthracite district philosophically. The ore situation remains unchanged and the grain trade continues to pick up, bidding for boats being lively.

Chicago—The possibility of a strike is inducing among those manufacturers, who have not yet closed for their next year's supply of fuel the disposition to complete arrangements, and quite a tonnage of this kind has been tied up within the past few days. But if there is any inclination to stock up in anticipation of that possible calamity, the evidences of it are few, as regards Western fuels, for operators without exception speak of the quiet state of trade. There is on track some demurrage coal which has been offered at concessions from recent prices and the tone of the market is not strong. Eastern coals are not so easily obtained, as the more Western products and the market is firm. Most of the coal mined for Western destination is going by lake and the car equipment so employed is taking pretty much the entire resources of the carriers for the Western trade. Prices are without notable change. There are ample stocks of anthracite in Chicago for three months trade.

Cincinnat—About 1,000,000 bushels of coal for this market is expected in a few days, and if received that amount would go a little way toward relieving the situation here. There is practically no active demand for coal at this time other than to fill contracts, and for this reason there is not the seriousness that would result from such a small stock of coal were it at any other season than just at the present. The price of coal afloat remains in the neighborhood of seven cents, though on account of the scarcity any price might be quoted with reasonable assurance of getting it. It is stated that some coal dealers who have contracts on their hands for slack for steam purposes are losing money daily, and that unless there can be received here some considerable amounts of coal within the next few weeks they will be in a somewhat unpleasant situation. There is no trouble, however, among concerns that rely on the railroads for their supply, and it is figured that a continued short supply of coal from up the river will result in some sort of an arrangement that will look toward supplying such firms as get their supply by river, so that they will be able to make deliveries.

Coke.

A summary of the Connellsville region for the week shows 20,578 ovens in blast and 708 idle.

The following figures show the scope of operations.

Production for the week	242,275 tons.
" last week	225,088 tons.
Increase	17,187 tons.
Shipments—	
To Pittsburg and river points........	3,984 cars.
To points West of Pittsburg........	5,717 cars.
To points East of Everson............	2,402 cars.
Total	12,103 cars.
Last week	11,541 cars.
Shipments in tons for week.........	254,163 tons.
" " " last week........	245,747 tons.
Increase	8,416 tons.
Masontown Field	
Shipments for week	562 cars.
" last week................	553 cars.
Increase......................	9 cars.
Shipments in tons..................	14,612 tons.
" last week................	14,378 tons.
Increase	234 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4 60 Stonega, $4.60

LOW RATE EXCURSION TO CALIFORNIA.

During the coming summer frequent opportunities will be offered by the Chicago, Milwaukee & St. Paul Railway to visit California at the lowest round trip rates ever offered with choice of routes from Chicago via Kansas City, Omaha or St. Paul, or going and returning via different routes. Electric lighted trains. Route of the Pioneer Limited. Famous Train of the world. Write for full information to F. A. Miller, General Passenger Agent, Chicago.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots; lot of 100 pounds, $1.10 per lb.: special price on large lots

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including May 19, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	518,238	269,026
Tidewater	189,790	58,417
Southwest	36,348	169,957
Eureka	20,089	602,179
Buckeye, Macksburg oil	5,224	252,228
New York Transit	458,961	
Southern	508,305	....
Crescent	103,144	....
Total	1,829,099	1,351,807
Daily averages	101,638	75,142
Buckeye / Indiana Local Division	916,063	904,336
Daily average		

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
May 14	$1.85	$1.20	$1.20	$0.88	$0.83	$0.83
May 15	1.85	1.20	1.20	0.88	0.83	0.83
May 16	1.85	1.20	1.20	0.88	0.83	0.83
May 17	1.85	1.20	1.20	0.88	0.83	0.63
May 19	1.85	1.20	1.20	0.88	0.83	0.88
May 20	1.85	1.20	1.20	0.88	0.83	0.83

The Metal Markets.

LONDON—Tin—£137 5s-£136. Sales, 500 tons spot; 1,780 tons futures.

Copper—£54 10s-£54 2s 6d. Sales, 1,350 tons spot; 2,250 tons futures.

Lead—£11 12s 6d-711 11s 3d.

Spelter—£18 11s 6d-£18 10s.

NEW YORK—Tin—$30.50-$30.25.

Copper—Lake, 12½-12¼; electrolytic, 12¼-12⅛; casting, 12⅛-11⅞. Lead—$4.15-$4.10 Spelter—$4.50-$4.37½.

ST. LOUIS—Lead—$3.97½-$3.95. Spelter—$4.20-$4.12½.

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2.25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	10.75	c
Copper, light bottoms	9.50	(
Heavy Composition	10.75	c
Brass Turnings	7.00	c
Heavy Brass	8.62½	c
Light Brass	7.87½	c
Heavy Lead	3.90	c
Tea Lead	3.70	c
Zinc Scrap	3.12½	c
No. 1 Pewter	19 00	c

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 60

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 901 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 160 lbs. $4 75

Ore Situation at Cleveland.

The strike situation has taken a peculiar angles The officers of the trust have made no particular movement toward starting their boats, but claim, nevertheless, to have gained a considerable advantage during the past week. The tugmen are manifestly becoming restive at the continued idleness and this more than anything else seems to be weakening their cause. Many of them have inclined this week to go into business with the independent tugs. In this port three crews have started in with independent tugs. At Ashtabula, three other crews have chartered as many tugs and are running them at their own expense. At Chicago many wild tugs are in commission, and at Buffalo the fleet of the independent tugs is holding its own, with association assistance. At Toledo a few trust tugs are running, but the independent tugs are doing most of the business, assisted by the new big tug, the American Eagle, which will do harbor towing At Duluth the trust tugs are running in small force and at the Soo the tugs owned by the Great Lakes Towing Company are running regularly by the permission of the association, since there is no wish to hamper the business through the government locks, which might bring about trouble for the strikers.

The running of independent tugs means to give the vessel owners the assistance which they lack through the strike of the tugmen. This would relieve the pressure from the vessel owners' side of the house; which otherwise might be brought to bear on the officers of the Great Lakes Towing Company to end the strike by yielding to the men. If the order is issued laying up the tugs, the men will be in even a greater predicament. What small means of livelihood the men obtain from running the independent tugs would be taken away and the cause of the men would suffer in the straightened circumstances of some of the members who are unable to stand out much longer with no work and no income. The tugmen are, therefore, in a peculiar predicament just now, and the trust officers are resting on their oars waiting for the men to fight it out among themselves.

Casting Combine Charter.

The combine of steel casting interests, the American Steel Foundries, $40,000,000 capital stock, will file papers of incorporation in New Jersey this week and the various constituent properties will be formally taken over on June 1. The promoting interests are now busy with a slate of officers and directors.

It is stated definitely that Daniel Eagan, president of the American Steel Casting Company, will not be president of the combine, although it is said that some prominent office will be reserved for him, probably the first vice presidency. A president has not yet been agreed upon. As for the directorate it will be composed mainly of United States Steel Corporation intersets, and of the larger stockholders in the constituent concerns.

The American steel foundrics combine will control 75 per cent of the country's steel casting output. It proposes to pay more attention to the foreign trade than that field has hitherto received, although active undertakings along th line are likely to be put off for a while, because every plant going into the combine is crowded with orders and has all it can do for the present to satisfy the domestic demand.

J. Charles Dicken, Thomas Ewing, Jr., anp William C. Dicken, of this city, are acting for other parties in an application for charters for the Car Wheel Foundry & Engineering Company, and the Central Car Wheel & Castings Company. Application will be made June 10.

Trade Publications.

"The Cow Pea" is the title of the latest publication issued by the Experiment Farm of the North Carolina State Horticultural Society at Southern Pines, N. C. This book neatly bound and illustrated in plain and concise manner discusses the value and uses of this important crop, the Cow Pea. Every reader can get a copy free by writing to the Superintendent of Experiment Farm, Southern Pines, N. C.

The Embracing Movement—The fact that United States Steel Corporation interests are conspicuous in the American Steel Foundries Company, now forming has recalled attention to the quiet manner in which the combine has been intrenching itself.

First Charles M. Schwab got control of the Bethlehem Steel Company. Then Messrs. Schwab, Gary and several other gentlemen prominently identified with the United States Steel Corporation formed the Pocahontas coal syndicate, which, before being turned over to the Norfolk & Western Railroad Company, made a contract with the United States Steel Corporation whereby that combine secured a source of unlimited fuel supply for an indefinite time. Pretty much the same interests next were revealed in ascendency in the Allis-Chalmers Company, and again in a new organization called the Chicago Pneumatic Tool Company. Still later, Mr. Schwab became heavily interested in the International Nickel Company, the significance of which may be understood when it is remembered that nickel enters largely into the manufacture of certain grades of steel and is bought, in large quantities by the United States Steel Corporation.

Now these same interests appear in the American Steel Foundries Company. The United States Steel Corporation has been at considerable pains to deny official interest in any of these transactions, but such denials, of course, are always to be regarded as technical.

The Bond Issue—Monday of this week the special meeting of the stockholders of the United States Steel Corporation was held in Hoboken, N. J., to authorize the issue of $250.000 000 five per cent bonds, which is to take up $200,000,000 of the present preferred stock of the corporation that draws 7 per cent and to provide a fund of $50,000,000 half of which is for cleaning up present obligations of constituent companies, and the remainder to be used for betterments and new plants.

The interest taken in Pittsburg over the location for some of the plants that the big corporation proposes to build is lively at this time, especially concerning the location of the new tube works. Local steel officials, while declaring they do not know where this big plant is to go, have their own opinion regarding it, and for various good reasons say that if one plant is built it will be at Conneaut, O., as President Schwab is known to be favorable to that site.

If there are to be two plants it is regarded as possible that they will be divided so that the product can be more readily shipped to the markets in the East and in the West. The building plans will be made active at once.

Buhl Sells His Stock—Frank H. Buhl has sold his stock in the Sharon Steel Company to George W. Darr of the banking house af Darr, Luke & Moore of New York. Mr. Darr, is president of the Sharon Steel Company, having succeeded Mr. Buhl to that office over a year ago. About 2,6[illegible] shares were involved in the transaction, but the price paid for the stock has not been made known. However, Mr. Buhl sold a large amount of his stock last year at $200 a share. If the recent transaction was made on the same basis something like $530,000 was paid for the Buhl holdings.

Practically all the stock of the Sharon Steel Company is now held by the Darr-Flinn-Magee estate interests. Mr. Buhl was one of the principal organizers of the Sharon company, but the recent deal represented the closing out of his interest.

Mr. Buhl, P. L. Kimberley and others have organized a company to develop electricity in the Philippines.

The Sharon Steel Company is capitalized at $5,000,000 and has a bond issue of $3,500,000. The company owns valuable iron ore properties, there being in sight about 20,000,000 tons of ore. The company also owns valuable coal mines. The coal properties of the company in Mercer county have a capacity of 2,000 tons a day, and the coal mines in Fayette county, which contain high grade coking coal, 2,000 tons a day. The limestone quarries of the company in Mercer county produce about 500 tons a day.

Marland, Neely & Company, South Twenty-first street manufacturers of nuts and bolts, have installed two six spindle tappers and are preparing to further increase the capacity of the machine shop. The company is also considering the advisability of taking up the manufacture of rivets.

The Cleveland Punch & Shear Works Company, and the Cleveland Crane & Car Company, of Cleveland, O., have established a branch office in 504 Frick building, this city, in charge of L. H Gibson.

GAS VS. STEAM ENGINES.

BY ALBERT STRITMATTER.

IN a recent issue of a well-known magazine, devoted to the generation and transmission of power, appears an article comparing the cost of operation of gas and steam engines. The article referred to states that the average expenses for each horse-power developed by steam, per year, are as follows; Fuel $5.16, attendance $2.07, supplies and repairs $0.90, fixed charges $5.13, total $13.26. These are the averages of figures collected by Dr. C. E. Emery in 1895, whose total was $15 per horse-power per year, of Frank P. Sheldon of Providence, R. I., whose estimate was from $11.64 to $14.35 as based on his investigations among New England textile mills, and also of the Warren, R. I., Manufacturing Company, whose estimate was $11.55. These figures were on the basis of runs of about 10 hours per day and the cost of fuel at Warren was $2.26 per long ton. The writer of the article then says; "The above figures represent, of course, the performance of large and efficient plants, but they are not only possibilities but accomplished facts. It is figures like these which must be put against gas engine possibilities. It is true that the average steam plant will require nearer four or five pounds of coal per horsepower hour. It is also true that notwithstanding gas engines run all 11 or 12 cubic feet of natural gas, the inspector of the natural gas districts will tell you that the engines in those districts average 45 to 50 cubic feet per hour per horse-power."

Not knowing the source of the information as to the consumption of natural gas as referred to, I am unable to say that the statement is not true, but if it is true there must be some condition causing it which should be considered in any comparison between the cost of operation of steam and gas engines. As has been shown in previous articles in these columns, the consumption of fuel in a gas engine depends largely upon the condition in which the engine is kept by the operator and whether or not the fuel is delivered to the engine in a proper proportion. The consumption of fuel in a steam plant also depends on conditions of a similar nature. And in a comparison of these two powers, we should consider both types under the same conditions, either both of them under the best possible showings, or both under average conditions, not one under average or poor and the other under ideal or the best conditions.

In the article referred to above it is seen by the author's own admissions that he has not compared the engines on an equal basis, for he admits that his figures for steam engines are taken from "large and efficient plants" and that the average steam plant will use "four or five pounds of coal," whereas his figures are based on a consumption of but 1½ pounds of coal per H. P. hour (in the case of the Warren plant). He further admits that his consumption of gas in gas engines is not of the best shown or claimed by its advocates, but takes his figures from reports of "average" rates of consumption, which can, however, clearly be shown to be excessive and not the average by any means.

There is one point which must also be considered in cases of this kind. Only efficient steam engines were reported on, while it is a well-known fact that gas engines known as "oil field" engines have a very large fuel consumption because they are used in localities where the fuel costs practically nothing and therefore an engine, on which extra expense has been put to reduce the fuel consumption and which must necessarily sell for more to the user, is not worth the additional price because the fuel consumed is a small item. As an illustration of the difference in price between "oil field' and "commercial" engines I may mention a man who, in reply to a quotation of $600 on a certain sized machine, stated that he could get one of the small size for $350. If we are to consider only the most efficient steam engines, therefore, we must distinguish between oil field and commercial gas engines.

But what is the actual comparative cost of operation of the average commercial gas engine on natural gas and the steam engine of the same power? On this point I may quote from the catalogue of one of the largest steam and gas engine, as well as electrical machinery, manufacturers in the United states, as follows:

"This is a problem requiring a special solution for each individual case. Considered solely as a machine for converting the total energy of fuel into mechanical work, the gas engine is by far the more efficient. We have gas engines in operation which transform over 25 per cent of the heat into useful work while in the very best recorded performance of steam engines barely 14 per cent of the energy of the coal is accounted for and in the average steam engine not more than five per cent. It will be seen that in considering the relative advantage of gas engines and steam engines, the problem must be carefully conisdered in every aspect, and it requires the painstaking care of a well-informed engineer.

"We are able to advise on the subject because we are not only manufacturers of steam engines but also of gas engines. As a general statement of the fuel consumption the following may be regarded as fair and conservative;

"Natural gas(approximately 1,000 B. T. U. per cubic foot), 10 to 12 cubic feet per brake horse-power per hour.

Ordinary illuminating coal gas (from 600 to 750 B. T. U. per cubic foot) 17 to 20 cubic feet per brake horse-power per hour."

This is a statement by a company which is well able to stand back of its guarantees and if their guarantees as above expressed were not borne out in actual practice they would soon be out of the business. As a matter of fact, every business man knows that when a responsible concern makes a guarantee they always make it on the safe side. And the fact is that there are few manufacturers of gas engines who will not guarantee a consumption of not to exceed 15 cubic feet of natural gas per horsepower per hour with engine in proper adjustment.

Comparing the cost of steam and gas engines, another prominent manufacturer of gas engines says;

"It has been found by careful investigation that high grade steam engines of 50 H. P. and over require three pounds of coal for a horse-power an hour. This, with coal at $2.50 per ton, means power at from $11.25 to $37.50 a year for each horse-power. Large gas engines may easily be run with from 14 to 17 feet of natural gas per horsepower per hour. This means power, with natural gas at 25 cents per thousand feet (which is more than the average price), at from $10.50 to $12.75 per year for each horse-power."

It must be borne in mind that these figures are not the best possible showing made by gas engines, but are those which the average user secures, and any gas engine manufacturer can refer to hundreds of his engines which will make as good or better showings.

For instance, the writer knows of one concern whose engines run on natural gas at 15 cents per M and on an average consumption of 15 cubic feet per horse power per hour. This amounts to but $6.75 per year for fuel per horsepower. The company figures that the power, including fuel, attendance, supplies, repairs and a 10 per cent depreciation per year on the cost of the plant, costs them but $14.55 per horsepower per year. Considering that this is based on comparatively small engines, two in number and each less than 50 H. P. in size, and that such small engines would hot be expected to show the economy of 100 H. P. or larger units, their cost per horse-power per year compares very favorably with the figures given on steam engines based on a consumption of about 1½ pounds of coal per horse-power.

Referring again to the items making up the total cost of steam-power in the article first referred to, the item of fuel $5.16, is based on a consumption of something like 1½ pounds of coal while the writer admits that the average plant consumes nearer three times that amount. Under average conditions of fuel consumption, then, the cost would be $15.48 which, together with the other items, although secured under better than average conditions, would make the total cost per horsepower per year $23.58 instead of $13.26.

Further information on this subject has recently been presented by Clyde D. Gray in "The Engineer," in an article entitled "An Investigation on the Loss of Power." One test of a large number of gas engines, none of which were over 65 horse-power, an average consumption of coal gas of 22.9 cubic feet per brake horse-power was shown. On larger sizes a better showing would of course be expected. As coal gas has so much less calorific value than natural gas, and as these tests show less than half the amount claimed in the article before referred to for natural gas, it would seem that consumption of 45 to 50 cubic feet was certainly excessive. But assuming that the engine did use 50 cubic feet per horse-power, what would be the cost for fuel? In the natural gas districts gas is often secured for power purposes as low as 10 cents per 1,000 feet, and in some places less. On the basis of 50 cubic feet per horse-power per hour and 10 hours per day, 300 days to the year, it would mean a consumption of 150,000 cubic feet per year. At 10 cents per 1,000 this would be only $15 per horse-power per year for fuel, which will compare favorably with steam plants which show as poor efficiency as a gas engine on this consumption. Of course with a gas engine the item of fuel is by far the largest expense, whereas with a steam engine the attendance, fixed charges and other expenses are greater in proportion to the fuel expense than is the case with a gas engine.

The Elimination of Silicon.

ANDREW M'WILLIAM, lecturer in metallurgy at University College, Sheffield, and William H. Hatfield, of the Meadowhall Iron & Steel Works, Sheffield, presented a paper entitled the 'Elimination of Silicon in the Acid Open-Hearth," at the annual meeting of the British Iron and Steel Institute held in London last week. The authors pointed out that in the manufacture of steels of very varying carbons occasional heats containing more silicon than was desired or expected would occur. Uniformly low silicons are now fashionable in some quarters. It has been thought that what is called a "sand boil" may have occasioned high silicons, or there may have been a special attack on the bottoms or banks of the furnace where the silica has been reduced to silicon, and transferred to the steel. Messrs. J. Crowley & Company having kindly placed at the disposal of the authors a 25-ton furnace, investigation was commenced. The carbon contents of the steel made were very varied, and the condition of the bottom and banks after the metal was tapped was tabulated alongside the corresponding percentages of silicons in the steels. It was found that the silicons were apparently quite independent of the other variations. The effect of varying temperature was next made the subject of study, but no clear indication was found of any predominating effect. Next the condition of the slag and its composition were considered, and here, it appeared, was the crux of the whole question. Analysis showed that the steels finished with thin slags were low in silicon, while those with thick slags were high. This condition could be varied at will. The proportion of ferric oxide to ferrous oxide, and the total amounts of oxides in the slag within the limits of experiment, seem to be of subsidiary importance, excepting that the help to determine the basicity of the slag.

In replying to the dicsussion, Mr. M'William said that it was to be remembered there were two authors to the paper, and it was the great skill of Mr. Hatfield in working the furnace that had enabled the experiments to be successfully carried out. What was put forward was only the beginning of the work, and, no doubt, temperature had an influence on the question that they intended to go into later.

ELECTROLYSIS OF CAST IRON PIPE.

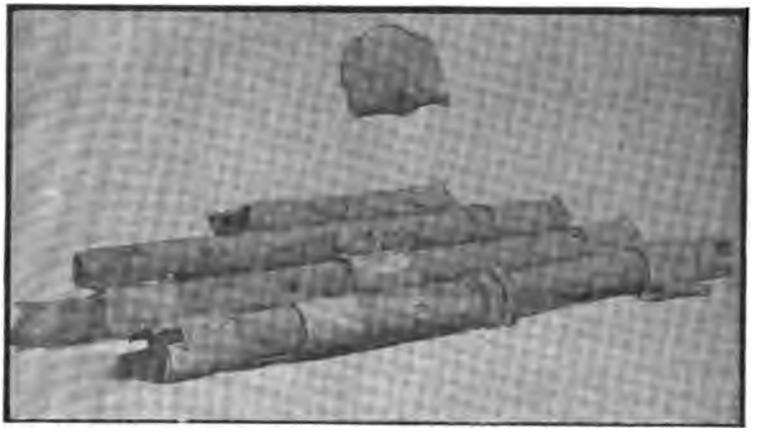
Samples of pipe destroyed by electrolysis, some in less than 15 months.

THERE is nothing more menacing to the life of cast iron pipe systems where return electric currents are allowed to pass through them than electrolysis and it may most justly be claimed that these electric currents should be taken care of by the parties responsible for them without injury to other interests. It is the subject of first importance to water and gas works' engineers to see that this is satisfactorily done. With present experience it is difficult to say just what effect a current of a given number of volts and amperes will have on a line of pipe. It is impossible for the engineer to know even approximately without great expense, the condition of his mains where electrolytic action is taking place: thus the gas or the water supply of large sections of cities is often in danger by the failure of mains without previous warning. In one case a 48-inch water main failed owing to the effect of electrolysis, leaving a large portion of one of our large Eastern cities without water supply. Another case—the leakage from a gas main caused an explosion in an adjacent property destroying the building. The soil in which the pipes are laid is second in importance only to the power of the current itself, a weak current often destroying the pipe in a short time due to salts or dampness in the earth, while a much stronger current in soil practically free therefrom may not do serious injury in years.

From Six Inch Main Indianapolis Water Co. Showing Beginning of Electrolytic action.

Effect of Electrolysis on Iron Water Pipe on 30 Days' Exposure.

Through the courtesy of A. F. Davis. of Indianapolis. we give a few extracts from his paper read before the Central States Water Works' Association. with illustrations from photographs taken in different cities in this country showing in a striking manner the effects of electrolysis. Some times the effect is not so apparent as indicated by the cuts. Mr. Davis says "I have found water mains affected without showing even the breaking of the coating of the pipe. Almost invariably when you find the sand gravel and earth adhering firmly to the pipe, there is destruction going on, although the pipe itself may show no visible evidence of the fact. If you analyze the earth which is so hard and so firmly attached to your pipe you will find that the iron of your pipe is being carried into the earth by the electricity, leaving only the carbon. Again, I have found pipe having a graphite color and feeling smooth, but upon moving the earth and running the point of a knife over the metal the knife entered soft spots in the pipe. This is the beginning of the pitting of the iron.



From Albany, N. Y. Holes Mended With Split Sleeves.

From Six Inch Main Milwaukee.

The destruction of the four inch gas main taken out near the power house of the Street Car Company, at Indianapolis, is peculiar and more complete than any I have heretofore seen. Pieces came out on the pipe in places as large as a dollar and there was no weight to these pieces that had been scooped out by the electricity. Where the spigot end of the pipe enters the bell it has the appearance of burned iron.

From Gas Main. Gas Escaping Through Hole Shown Found Its Way Into a Dwelling Causing an Explosion That Wrecked the Building.

The injury due to electrolysis, of course, is invariably due to the return currents of the various trolley systems; the points where the currents leave and return to the pipe or pass again either to the rail or to the power house are the points where the cast iron is eaten away. Bonding the rails, if effectually done, gives some relief though whether in this way the rails can be satisfactori-

ly made to take care of the entire return current is uncertain. Bonding the pipe joints to keep the currents from leaving the pipe may do some good, but it is expensive and is not to be recommended. The most satisfactory method yet adopted is the use of an insulated return wire, laid in the road bed, of sufficient size to easily take care of the entire return current, thus avoiding the necessity of the current seeking the channels. This wire may be overhead, but better still laid in the road or underground conduit.

From Four Inch Main, Milwaukee.

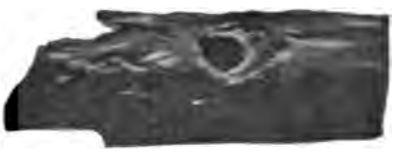
Yet it is not the function of the pipe manufacturers or users to say how their pipe shall be protected. The methods to be pursued should be left entirely in the hands of the electric companies and they be held responsible for any damage that is done."

Steam Turbines on the Electric "Underground"—The British Westinghouse Electric Manufacturing Company has received the contract for the supply of the whole of the power equipment to be put down in the electrical generating station of the Metropolitan Railway, London. The main generators will consists of three-phase alternators direct coupled to steam turbines, and three of these sets, each of 3,500-kilowatt capacity, are to be put down to the Metropolitan company's works at Neasden. The British Westinghouse company is also providing similar machinery for the District Railway Company, four turbine alternator sets of 5,000 kilowatts being the arranged installment for their works in Chelsea. In both cases the energy will be generated in the form of three phase current at a pressure of 10,000 volts. Substations are to be put down and equipped with transformers and rotary converters for reducing the voltage and for converting the alternating current into direct current for use on the train motors. The use of steams turbines in such large units for the generation of electric power is a distinct departure from ordinary practice. and the behavior of the power plants of the "Underground" will be watched with the greatest interest by all power engineers. The steam turbine certainly has many important advantages over the reciprocating steam engine for electrical work: some of these advantages are: small size for power, high speeds whereby size and cost per unit output of the electric generator are reduced; absence of vibration, small foundations. The Westinghouse company has for several years been at work on steam turbines, and has succeeded in producing a form which is remarkably economical. and can be built for very large powers. It is expected that the bulk of the plant will be manufactured at the new Westinghouse works in Manchester, which are practically completed. It is pleasing to note that the Metropolitan and Metropolitan District Railway companies, having definitely decided upon the details of the conversion of their lines, are determined to push the matter forward as rapidly as possible, and they have started well by placing their first large contracts in the hands of engineers who have the highest reputation for speedy and accurate work in large power electric installations

ELECTRICAL ENTERPRISE IN WALES.

Electrolysis—From Four Inch Main Indianapolis Gas Company.

WALES is at present much interested in what promises to be the most gigantic enterprise in the principality — the South Wales Electric Distribution Company, which is building a large generating station at Pontypridd. The station, when completed, will control no less than 70,000 horsepower, and no one unit will be smaller than 3,000 indicated horsepower. Below is a description of the plant, summarized from an article in the "South Wales Daily News."



From Eight Inch Main Showing Result of Four Years of Electrolytic Action

This enterprise is expected to have a far reaching effect upon economic conditions in the country. Cheap power will be available everywhere, not only for the production of articles of commerce, but also for their speedy conveyance to market.

At present, five combined sets of triple-expansion engines and generators, together with 24 water tube boilers, and all the necessary auxiliary machinery, switchboards, mains, etc., are being provided for, and will be at work within 12 months from the present time.

The boilers are of the water tube type, a very large number of which are in use in South Wales. Up to a few years ago, the only boilers employed were those which consisted of a round shell in some part of which was placed a fire, and the flames and hot gases from this fire passed sometimes through one large and sometimes through 200 or 300 small tubes surrounded with water. In the modern and more efficient boilers, the order of things is reversed. In these, tubes which contain water are set at an angle, in order to keep the water constantly on the move, and are surrounded by the flames and hot gases from the fire. The cold feed water enters at the bottom of the tubes, rises of its own accord as it becomes heated, and, toward the end of its climb, is converted into dry high-pressure steam, which passes into a chamber provided for the purpose, whence it is led to the engines.

The boilers that are now being made for the Pontypridd station are of the Niclausse type, which have given such excellent results in the ships of the French navy and elsewhere, and they are being manufactured by Messrs. Willans & Robinson, at their works on the Dee, near Hawarden.

Each of the 24 boilers will evaporate 1,400 gallons of water per hour when fired with slack coal, and will generate this steam at a pressure of 200 pounds per square inch. The coal to feed them will be brought straight from the pit, along a siding connected to the Taff Vale railway, and above the level of the boilers, and will be shot into hoppers, one above each fire-hole door. The ashes and clinker left after burning will drop through another set of hoppers direct into trucks in the basement beneath the grates. Instead of building one or more costly chimneys, forced draft will be employed, created by means of electrically driven fans, and allowing of the nicest and most exact regulation to suit the varying requirements of the work to

be done, and also allowing the commonest and cheapest coal to be burnt—coal which is often waste product at the colliery. The feed pumps which supply the boilers with their water will also be driven by electric motors, and each will be capable of supplying 10,000 gallons of water per hour against the boiler pressure of 200 pounds to the square inch; and, in addition, injectors will be provided to supply the boilers with water, should any accident happen to the pumps. The steam generated in the boilers will be conveyed to the engines by a system of piping so arranged that any engine can be supplied from any boiler. Further, any engine or any boiler, or both, can be completely shut off from any other and also from the main steam supply, so that temporary repairs can be performed with absolute safety.

The five main engines of 3,000 indicated horse power each, are in course of construction at the Rugby works. They are of the universally known vertical triple-expansion three-crank condensing type, in which three really separate engines, each consisting of a high, an intermediate, and a low-pressure cylinder, all work onto one main shaft provided with three cranks set at angles of 120 degrees apart. Each set of three cylinders is single acting, the steam only pressing on the top side of each piston, and in consequence the pistons, piston rods, connecting rods, cranks, and brasses are always in a state of compression, and do not experience that change from compression to tension, and vice versa, many hundreds of times in each minute that occur in an ordinary engine and are so injurious to the mechansim itself and so productive of unsteady running. These engines work at 160 revolutions per minute and develop 3,000 horse-power each, with a steam pressure of 180 pounds to the square inch in the high-pressure cylinders and a vacuum of 52 inches in the condensers.

The condensers, with their air pumps, each capable of turning about 22½ tons weight of exhaust steam back into water per hour, will be placed in the basement below the respective engines. The water-circulating pumps for the condensers each capable of delivering 200,000 gallons per hour against a head of 40 feet, as well as the air pumps, will electrically driven. The main generators will be coupled direct to the the crank shafts of the engines, and will therefore run at the same speed, namely, 160 revolutions per minute. They will generate a three phase alternating current pressure of 12,000 volts, and with a low periodicity. Each generator is so designed that it can be satisfactorily worked in "parallel," with all or any of its fellows—that is to say, should three out of the five be working, and should another be required, it can be started, run up to its right speed and pressure, and then attached to the load without any danger of itself "jibbing" or of making any of the others inclined to "jib."

The building in which this plant will be installed, and of which the foundations are nearly completed, will, when finished, be of the following dimensions: Length, 760 feet; width, 277 feet; height, 55 feet. The "mains"—or, in other words, the properly insulated and protected copper conductors which are to convey the power generated in the station to the company's various consumers—are a subject of peculiar interest. Electrical energy is a form of power about which, less is known but with which more can be done than by any other agency known to man. It can be conveyed with almost negligible loss through enormous distances under, through, or over anything, around corners, up mountains and down precipices, through earth, air, or water, and it can at any state be measured with the greatest exactitude, and the work which it will perform can be reckoned to one-tenth of one per cent; but it will only arrive at its destination in this desired form if the "conductors" which convey it are of the best possible description. The three-phase current requires a three-core cable, each core of which is made up of strands of the purest obtainable soft copper wire. Each of these three cores is insulated with paper wound round it, layer after layer until at least a thickness of a quarter of an inch is obtained. The separate cores with their paper coverings are then placed in a chamber from which all air is exhausted (and with the air, the moisture in the paper is also drawn out) and the insulation is then, while in that dry condition, thoroughly impregnated with fine bitumen oils, which have not only the excellent insulating qualities, but which are also entirely waterproof. Hence, the copper conductors, first covering, which

was dry to start with, will remain dry forever. The three cores are next stranded together into one rope, and are made up into circular form by more paper impregnated with bitumen oils as bove. The "cable," as it is now called, is then passed through a bitumen and wax compound, and afterwards has drawn upon it externally by hydraulic presure a lead sheath one-eighth of an inch in thickness and without joint of any kind. This jointless lead tube or sheathing is, of course, water tight, and allows the cable to be laid, if necessary, even through the bed of a river without fear of its being damaged. Over and around the lead sheathing a ring—and often a double ring—of steel wires is tightly wound, which affords complete protection against mechanical injury. In fact, it would give a strong man armed with a pick a deal of trouble to make any impression on such a cable. But even now, the cable has another protection given it. It is laid, some two feet below the surface of the ground, in earthenware troughs, and these troughs are then filled in with molten bitumen, which sets, not too hard to be got out again if required, all round the cable, which is thus rendered absolutely water, air, and gas proof. Finally the troughs are covered in by earthenware tiles set fast in the hot bitumen.

These cables, which have to carry energy at a pressure of 12,000 volts, are tested before leaving the works, at a pressure of 25,000 volts, and this test is made after they have been totally immersed in water for 24 hours.

The whole of the cables for the company are being made at the Erith works of Callender's Cable & Construction Company, limited, which will begin laying the first set of mains early in the summer.

Electric Shocks—Three papers on this subject, recently read before the Institution of Electrical Engineers, should, at the present juncture be read with general interest. The first details quite a number of experiments with shocks at 500 volts pressure, and in that connection it is shown that alternating currents are many times more painful than direct currents, the sensation, however, being of a different nature. The dangers of shocks at that pressure have been largely exaggerated and misunderstood by laymen. The writer points out that dry wood and dry boots, without large nails, offer so strong a resistance to electric current that it is quite safe to touch an overhead trolley wire whilst standing on a dry tram-car, or even when standing on the ground or on the rails—this he states from his own personol experience. However, in wet weather the case is largely altered, but even the boots must be very thoroughly saturated to permit enough current to pass to produce a severe shock. With third-rail electric railways a like immunity exists, as, with dry and sound boots, scarcely anyone can feel a shock whilst standing with one foot on the live and the other on a track rail. A shock is experienced with damp or wet boots, but neither the sensation nor the degree of wetness of the boots can be measured with any accuracy. It is further demonstrated that the conditions under which 500 volts shocks cause death are very exceptional indeed. The author of the second paper, in dealing with cases of shock received up to 2,000 volts pressure, arrives at the concluison that in spite of recent agitation, there is really nothing more dangerous in the alternatin system than in the direct current. It is in effect solely a question of voltage, and of the conditions being favorable. As a great number of conditions are required to be favorable, it would appear to be really difficult to get killed, even with a high voltage. Practically speaking, in fact, the chances of danger are no greater than in other occupations.

ELECTRICAL CONDUCTIVITY OF ALUMINUM.

W. MURRAY MORRISON. (British Institute Electrical Engineers,) In Aluminum World.

NUMEROUS tests of the specific resistance of pure aluminum have been made by Lord Kelvin and others, proving it to have a conductivity (copper being 100) of from 60 to 65 per cent, depending on the purity of the metal tested. A recent determination by Professor E. Wilson, of King's College, London, of aluminum 99.55 per cent pure (the average purity of the commercial metal) shows it to have a specific resistance of 2.762×10^{-6} legal ohms, at 15 degrees C., with a temperature coefficient of .00393, and a linear coefficient of expansion of .000023, between 16 and 100 degrees C. Comparing this specific resistance with that of copper (Matthiessen's standard, 1.696×10^{-6} ohms at 15 degrees C.) we get its electrical conductivity equal to 61.4 per cent. Comparison of the outstanding properties of copper and aluminum wire is given in Table V., the conductivity of the latter having been taken in a round number slightly lower than the actual figure given above.

Table V.

Comparative Figures of Copper and Aluminum Wire.

	Copper Wire.	Aluminum Wire.
Specific gravity	8.93	2.65
Conductivity	100	.61
Section for equal conductivity	1	1.64
Diameter for equal conductivity	1	1.28
Weight for equal conductivity	1	.485
Weight for equal section	1	.297
Tensile strength for equal section	1	.46
Tensile strength for equal conductivity	1	.75

It will be seen that for equal conductivity an aluminum wire has to have, compared with a copper one, a section increased by 64 per cent(diameter increased by eight per cent), but that a saving in weight of 52 per cent is obtained, which, when transport is considered, is valuable, and which also admits of fewer and lighter poles being used as supports for overhead wires. For equal conductivity aluminum has only three-quarters of the tensile strength of copper, which, especially with small wires, may in some cases be insufficient. For this reason alloys are frequently used, by which means the tensile strength can be increased to equal or surpass that of copper, with, however, a corresponding decrease in conductivity and increase in weight. Alloys equalling the strength of copper for equal conductivity with a reduction of from one to two of percentage conductivity, and an increase of only about two per cent in weight, have been produced, and extensive experiments in this direction are still being conducted.

For the transmission of a given current at a given loss, aluminum having a larger surface than copper would have, the heating effect of C^2R losses ought to be smaller. One of the initial difficulties in the use of aluminum conductors was the making of a satisfactory joint. Many solders have been proposed for aluminum, only one or two of which have apparently proved satisfactory, but their manipulation, even if satisfactory, scarcely admits of their application in the field, so it is to mechanical jointing that one has to look. A number of such joints having the requisite mechanical and electrical properties, are in constant use, and the description of several of them may be of interest.

In America, the most generally adopted joint is known as the "McIntyre joint," and consists of a flattened tube of aluminum into which the two ends of the wire are inserted, the whole being given two or three complete twists.

At Foyers we have many tons of aluminm wire, cables, and strip in use, and have designed various joints for use in connection with them. With strip the ends are overlapped, holes drilled through and through, and riveted up tightly with aluminum rivets. It may be here said that aluminum, being a highly electro-positive

metal, no other metal should, if it can be avoided, be used in contact with it, other wise there is the risk of electrolytic action setting in.

We have a telephone line of No. 12 S. W. G. wire running a distance of about six miles over exposed country, supported on poles placed about 50 yards apart. The joints in this case are made by twisting the ends of the wire round each other, and bending round the loose ends outside the main wire to form a semi-circle with a radius of about one inch. The two ends are butted together, held by pliers, and welded in the flame of a blow-lamp. The joints in this line have given no trouble, but the wire in the most exposed positions has broken several times during very high winds. The wire being of pure aluminum, and being of so small a diameter accounts for this, and there is no doubt that for telephone or telegraph lines of small diameter, it is necessary to use an alloy. Comprehensive experiments with the view to finding a suitable alloy have been, and are being carried out, lines being also under trial at the present moment by the post office authorities and others. It is believed that solutions of the problem have been arrived at, and no doubt aluminum wire for these purposes will be ultimately as successful as copper ones, the success of which, it must be recollected, also entailed endless difficulties and failures in the early days.

The most interesting line is bare overhead transmission one of .38 inch diameter, having a total length of about 5,500 feet. The wire is bound by means of thin aluminum wire to insulators carried on poles about 40 yards apart. This line was erected between four and five years ago, is in constant use, and has given absolutely no trouble in any respect. Being primnarily an experimental line, the wire was put up in short lengths, so as to give a large number of joints. There are 28 of these of different kinds, the best of which I may describe. The two ends of the wires are bent round each other or simply butted together—they are then surrounded by a cigar shaped mold in two halves, which are clamped together, and molten aluminum run in at a hole in the top of the mold. The mold is then removed and the ioint trimmed. Aluminum having a low melting point, the metal required for this joint can easily be melted in a hand-ladle on the fire of a portable forge. Tests of the electrical and mechanical properties of these joints prove that they are more than equal to those of the original wire. Samples of some of the above joints are exhibited.

For connections, flexible and strip, between dynamos and furnaces, a large number of tons of aluminum are in use with the most satisfactory results. This is a case in which, even were no actual saving in first cost secured, it would still be preferable to use aluminum in place of copper, for the saving in labor in handling is most important.

When first asked to put down aluminum instead of copper, I felt great misgivings, having the usual prejudices in favor of the latter, but after nearly six years' practical experience of the handling and use of aluminum wires my opinion is entirely altered, and I am fully convinced of the advantage to be gained by their use, provided always that the first cost compares favorably (due consideration being also given to the reduced weight) with that of copper for the same conductivity.

With regard to insulated cable in low tension work, aluminum cannot compete with copper at present prices, unless the cost of dielectrics falls considerably, as in such cases the radial depth of insulation is determined almost entirely by considerations of mechanical strength, durability, and board of trade regulations. Should the price of copper increase, or that of aluminum diminish, as it seems quite likely to do with a more extended use, then there will no doubt be competition. In order to see of what order prices would have to be for such a contigency to arise, the author has taken the case of armored, lead covered, paper insulated cables, of the highest class, ready for laying directly in the ground, and found that, with copper at 10d. per pound, aluminum wires, insulated and sheathed in a similar manner, of the same conductivity as copper (i. e., 1.64 times the section) would have to be obtainable, to equal the cost of the copper cables, at from 14.5 d. to 16.5d. per pound for sections equivalent to from to one 0.2 square inch of copper. In vulcanized rubber cables the

would be a saving in total weight, averaging about 15 per cent, but in lead covered cables the weight for equal conductivity would be increased by an almost similar amount, the insulation and sheathing forming, as it does, so large a percentage of the total weight of the cable.

The case of high tension cables is, however, on a different footing, and is a matter of extreme importance, in view of the many power bills, which have recently passed through parliament. The lack of proportionality between the radial depth of insulation in cables and its dielectric strength was called attention to by Mr. Swinburne in June, 1899, and has since been very fully dealt with by Mervyn O'Gorman in his paper read before the Institution in London in March of this year. Mr. O'Gorman there shows conclusively that, for a given voltage of supply, there is a certain section of copper which gives the cheapest cable. Above this size the increase in price is approximately proportional to the section of copper, while below this section the increased radial depth of insulation necessary, on account of the smaller conductor, makes the cable more expensive. Thus, in one of Mr. O'Gorman's curves, it is shown that for 20,000 volts, and paper insulation with lead sheathing, 0.4 square inch is the section of copper, which gives the cheapest cable. Suppose in a given case the voltage of supply is 20,000—a not improbable figure in view of the considerable areas which some of the power companies are to supply—0.4 square inch will then be the section giving the cheapest copper cable it is possible to get. Suppose, however, that a feeding point is to be supplied with a certain quantity of power, and that the distance, and permissible losses, are such that 0.4 square inch of copper a larger section than is required under the circumstances, and that 0.25 square inch of copper would be sufficient. Then, by substituting 0.4 square inch of aluminum for the copper, we get a cable which fulfills the necessary conditions, and costs from £150 to £170 less per mile than the copper one, apart from saving in weight, which reduces the cost of laying. Thus for all high voltages there are certain circumstances under which aluminum cables are considerably cheaper than copper. This point deserves full consideration by those responsible for the installation of high tension transmission lines.

Wire For Telegraphing and Telephoning.

The question of the employment of hard-drawn copper or overhead line wire was one concerning which conflicting views were held 15 or 16 years ago, when the extensive use of this metal began in the telegraphing and telephone service. At that time, and at intervals since then, the advocates of silicon bronze and phosphor bronze wire have urged the employment of those metals for overhead wires, especially for telegraph and telephone purposes chiefly on account of the greater tensile strength of such wires as compared with hard-drawn copper. Indeed, several hundred miles of such wires were experimented with in 1882 and 1883 by the British post office telegraph department, presumably in the belief that hard-drawn copper wire was not suitable. The fact, however, that hard-drawn copper wire possesses 98 per cent of the conductivity of pure copper, has ample tensile strength to support itself on the poles, and is sufficiently ductile to meet all the requirements of practice, has hitherto seemed to telephone and telegraph engineers in the United State a valid reason for employing this metal in preference to silicon or phosphor bronze wire with but 85 per cent and less, of the conductivity of pure copper, even admitting the greater tensile strength and ductility of the latter wires. Of course, for long spans, over rivers or ravines, the high tensile strength of silicon or phosphor-bronze wire would render it superior to the hard drawn copper article. It may be noted in connection with this subject that the almost total disuse of iron wire for overhead telegraph purposes, predicted by many upon the advent of hard-drawn copper wire, has not followed, and large quantities of iron wire are still being employed for this purpose, as an instance of which it may be stated that one of the largest iron wire works was recently 27,000 miles behind orders for galvanized iron telegraph wire, notwithstanding that the works had been going night and day for over two years. The high price of copper during the past few years has doubtless contributed very measurably to this continued use of iron wire.—Cassier's Magazine for June.

NOTES FOR THE CHEMIST.

Determination of Silicon in Ferro-Silicon—George L. Norris, (Jour. Soc. Chem. Ind. Vol. XXI. No. 8) Owing to the difficulty of decomposing ferro-silicon by means of acids, the usual course of procedure has been to effect the decomposition by means of fusion with sodium carbonate. This necessitates the evaporation to dryness of a solution loaded with salts; and, for accurate work, a second evaporation to dryness of the filtrate. In the course of some work with ferric chloride, I was led to believe that I could, by the use of this reagent, determine the silicon in ferro-silicon accurately and rapidly. The method as adopted is as follows:—

Half a gram of powdered ferro-silicon is dissolved, in a beaker, in solution of 10 grams of ferric chloride (U. S. P.), 50 c. c. of strong hydrochloric acid, and about half a gram of tartaric acid. The solution is rapid and requires little heat. When solution is completed, add 25 c. c. of a strong hydrochloric acid, and boil for a few minutes, remove from the lamp, dilute with cold water and filter, washing with hot dilute hydrochloric acid and hot water. The silicon is seldom stained with iron oxide, and filters very easily, not being at all slimy. The time required for the analysis is about one-half hour. The following are tpyical results on the same sample:—By fusion method. 1st., evporation, 12.11 per cent; 2nd., 0.52 per cent. Total silicon, 12.63 per cent. By ferric chloride method, 12.68 per cent.

Determination of Copper in Iron—H. Koch, (Ziets. anal. Chem. 1902, 41) When iron is dissolved by diluted sulphuric acid all the copper remains in the undissolved residue. Treat 100 grams of the sample wtih 200 c. c. of sulphuric acid of 30 degrees Be. (sp. gr. 1.26). Heat and add the same amount of acid, also 500 c. c. of water to prevent separation on ferrous sulphate. When sample is dissolved, collect residue on a filter. The residue from cast iron should be wash back into beaker and treated with a little fresh sulphuric acid to dissolve the last traces of iron then returned to the same filter and well washed. Dry, ignite, dissolve in fuming hydrochloric acid, add sulphuric acid and evaporate to dryness or fumes. Cool, take up in 20 c. c. of water and 20 c. c. of nitric acid (sp. gr. 1.20.) Filter, dilute to 120 c. c. add a few drops of oxalic acid and electrolyse for 10 hours. The anode is a helix of a platinum wire 1.3 m. m. thick, lying on bottom of beaker; the cathode a cylinder of foil 9×3.5 c. m. A current of 0.094 ampere per square c. m. is used.

Detection of Arsenic in Hydrochloric and Sulphuric Acids—E. Seybel and H. Wikander, (Chem. Ziet, 1902, 26,50) Five c. c. of hydrochloric acid or the same amount of sulphuric acid (which has been diluted to sp. gr. 1.45) are mixed with a few drops of a concentrated solution of potassium iodide. In the presence of arsenic in either state of oxidation, a yellow color or turbidity due to arsenic tri-iodide is formed. If the sulphuric acid contains lead, the precipitation of lead iodide may be prevented by adding some pure hydrochloric acid. Some other impurities may be present which interfere with the reaction, for instance. nitroso compounds, in the sulphuric acid; or free chlorine or ferric chloride in the hydrochloric acid. The test will show the presence of one part of arsenious acid in 100,000 parts of the above acids.

Determination of Potassium in the Presence of Sulphates—Zopfchen (Chem. Ziet 1902' 26,159) Before proceeding with the precipitation of potassium by means of platanic chloride, it is necessary to remove any sulphates present by addition of barium chloride, any excess of which should be again removed by adding dilute sulphuric acid. As, however, a trace of the latter does not interfere with the reaction, much time may be saved by merely adding barium chloride solution until the precipitation is nearly complete.

Iodine Number of Oils—C. A. Jungclaussen (Apoth. Ziet. 16-798) Hanus's method (Abstracted in these notes, March 27) is strongly recommended but the author thinks the reaction is not complete until after three or four hours when working on some oils.

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EDITORIAL COMMENT.

Working the Other End Now—After several months of unfulfilled promises the Pennsylvania railroad proposes to begin another method by which it is hoped, presumably, to divert the attention of the shippers, especially those who ship iron and steel, from the actual conditions attending the transportation of those products. For a time the Pennsyvlania railroad managers insisted that there was no such condition as a shortage in cars and motive power. There might be some undesirable conditions surrounding the expeditious handling of trains due to causes foreign to direct management of the system of transportation, but there was no shortage of cars and locomotives. As time went on and the current development of business pointed out with a clearness that was not only convincing to all who had an interest in the situation, but was a complete refutation of the assertions of the Pennslvyania railroad, there came a half admission that perhaps the tonnage offered by shippers, especially those of iron and steel, exceeded the capacity of the railroad to properly handle it. Then followed a series of promises which have been best observed in the breach. The variety of these promises was an example of how diplomatic men crowded to the wall by righteous claims of embarrassed men of extensive business affairs may become on extreme occasion.

Now the Pennsylvania railroad proposes to complete the loop around the iron and steel men of the Pittsburg district by resorting to the per diem charge system. The claim is made that the per diem charge will have the effect of reducing the delays to which cars are always subject, and, according to the railroad officials, peculiarly susceptible just now. It is said in further explanation that cars are held for long periods in sheer carelessness and negligence. This negligence is placed upon the shippers and receivers of merchandise and the punishment is to be made to fit the offence. Popularly the supposition exists that the railroads had in their employ men qualified to attend to and remedy just such occurrences as those set forth in the latest discussion by the Pennsylvania railroad.

The real humor in the case becomes apparent when one recalls what the iron and steel manufacturers of the Pittsburg district in particular have said from time to time and that includes the present day as well as several months ago. The number of cars all told has been far too low to reach the requirements of the Pittsburg district iron and steel shippers. The claim of the railroad men that cars are being held in unusual spots, inaccessible to them, is met by a number of sample instances right here at home in which the loaded cars were removed from the mill yards of the producers but were dropped at points between the steel plants and the destination. One of the most brilliant examples was that of a consignment of steel billets shipped from the Duquesne plant of the Carnegie Steel Company for Monessen. After a wait of two weeks from the time the billets left the Duquesne steel mill the consumer came down and made a personal search for his lost material. After some days he found it at Port Perry where it remained for some time longer before it was finally shipped to its destination. The instance is only one of many, all much alike in general feature, and each sufficient to show that the delay could not by any stretch of railroad fiction be charged up against the promptness of the men in the iron and steel trades. The billets had been taken away to ease the demands of the Carnegie company, probably, and dropped at Port Perry in plain sight of the spot from which they had been taken. At that time every track and siding was literally jammed with loaded cars. The fact was that the railroads were utterly unable to move them with any degree of promptness and are even now under the same handicap with some modifications.

The new equipment of cars and locomotives turns out to be a mere replacing of the old and

worn out with the new. There is little or no real addition to the equipment of the railroads and in the nature of things there cannot be much improvement for long time to come. The railroad equipment has been permitted to run down for so long that the remedy cannot be supplied in a month or two. Some of the shifting engines at use in the yards in and about Pittsburg seem to be relics dug out of the scrap heaps many, many years old. They are unfit for the use to which they are being put and their users should be ashamed to acknowledge that they have so far neglected their duty to the shippers as to be forced to resort to the employment of such machines.

OBITUARY.

JAMES HUSTON WATT—James Huston Watt, president of the Watt Mining Car Wheel Company, died on May 2. 1902, at Philadelphia, after a lingering illness.

Personals.

Assistant Superintendent E. F. Wood, of the Homestead department of the Carnegie Steel Company has resigned. H. D. Williams has been appointed to succeed him, and G. Edward Weisner was given the place made vacant by the promotion of Mr. Williams, that of superintendent of the 28 and 36-inch blooming mills.

Clarence M. Mendenhall, who recently resigned the position of superintendent of motive power of the Chicago & Alton railroad, has been apapointed assistant to the general manager of the Pressed Steel Car Company. Mr. Mendenhall will take charge of his new duties at once.

Joseph T. Welsh, Youngstown, O., has been appointed night superintendent of the continuous and finishing mills at the Bessemer plant of the Republic Iron & Steel Company.

George A. Baird has been elected a director of the Republic Iron & Steel Company to succeed William Nelson Page, resigned.

Tennessee Company Conditions—The report of the Tennessee Coal & Iron Company for the quarter ended March 31, was made public May 24. While the earnings for the first three months of the year show an improvement as compared with the report of the company for the year ended December 31, still they by no means justify a resumption of dividends on the common stock. The net earnings for the quarter aggregated $368,060, which are equivalent to about 6½ per cent on the outstanding $22.300,000 common stock. After setting aside $118,333 for depreciation and the payment of $4.966 dividends on the preferred stock, there remains a balance of $245.061 or about four per cent on the common stock. In view of the wonderful prosperity the iron and steel industry is now enjoying, the showing for the quarter cannot be called remarkably good one.

Prints Not So Valuable.

A partial hearing was held May 22 in Common Pleas court No. 1 in the case of the Pressed Steel Car Company against J. M. Hansen, for an injunction and reciever, for taking blue prints from the office of the plaintiff company. The testimony indicated that these prints had been made for Mr. Hansen, formerly chief engineer of the plaintiff company, later president of the Standard Steel Car Company, and he admitted that he had possession of them.

It appeared, however, that some of the blue prints of the Pressed Steel Car Company were in the possession of the Standard Steel Car Company and objecton was made that the Standard Steel Car Company should be brought in as parties to the suit, and the hearing was continued so that the bill might be amended to include the Standard Steel Car Company and cover all blue prints.

In Mr. Hansen's answer, which was filed last Friday he alleges that it is not true that the plaintiff's business cannot be carried on without the prints, or that they would be of any value to the Standard Steel Car Company. He says that any one familiar with such work could construct almost all of the drawings. He declares the blue prints are merely copies, and upon one occasion, in order to examine them he had a set sent to his office. Some of these were destroyed, he said, and as to the rest he does not know what became of them.

The Wage Conferences—Wage conferences between manufacturers and officials of the Amalgamated Association of Iron, Steel and Tin Workers are to be held during the coming month. The first of them will be with the Republic Iron & Steel Company, in Columbus, O., next Tuesday. The bar iron scale, which is the main one to be settled by this company, will be of importance and upon it will be settled the scale of the other manufacturers of this line working under union rules. There is just a little significance noted in the fact that the Amalgamated asociation, has this year shown a decided preference for the Republic company in the settlement of its wage agreements, and has permitted that company to set the pace upon which the other companies, including the interests of the United States Steel Corporation, will base other settlements.

Power from Alcohol.

FRANK H. MASON, in June Cassier's

A most interesting and suggestive special exposition, held at Berlin last February and March, was that of the German alcohol industry. It was located in a large group of buildings erected for exhibition purposes by the National Brewers' Association in a Northern suburb of Berlin, and, although remote from the business portion of the city, it attracted a large attendance, mainly of persons more or less directly concerned with the production or with one or more of the many and rapidly increasing uses of alcohol for domestic and industrial purposes.

In a consular report submitted to the United States government at the time by the writer, it was explained that for several controlling reasons this whole subject has reached in Germany a stage of development which gave to the recent exposition a suggestive meaning for agricultural and industrial economists in other countries. Germany has no natural gas wells or native petroleum supply. When, some years ago, the question of adopting motor carriages for military purposes was under discussion it was remarked by the officals of the War Department that kerosene and gasoline engines could be operated only with one or other of the products of petroleum, which is not obtained in Germany, and the supply of which might, in case of war, be wholly cut off. But the broad, sandy plains of Northern and Central Germany, —in fact, all agricultural district of the empire, —produce in ordinary years cheap and abundant crops of potatoes from which alcohol is easily manufactured by processes so simple as to be within the capacity of every farmer.

The crude molasses left as a refuse product of the raw beet sugar manufacture contains from 40 to 50 per cent of sugar which cannot be crystallized, and this can also be utilized as a material for the production of alcohol. Under these conditions "spiritus" as it is known in Germany, became one of the standard and important products of agriculture, and every effort has been made by the imperial and State governments to promote and extend its use for domestic and industrial purposes. Inventors and scientists have been busy with improvements in the processes and machinery of distilleries. New and highly perfected motors, lamps, and cooking and heating apparatus have been devised and put in use, until crude alcohol is becoming one of the most widely utilized products of German industry.

Official statistics show that during the year 1901 Germany consumed for technical purposes no less than 116,000,000 liters (30,624,000 gallons) of denaturized alcohol, on which no tax was paid. As a concrete result of these conditions, and the pre-eminence of the Germans in every form of applied chemistry, the recent exposition was typical, and fairly represented the highest results yet attained in the production and utilization of alcohol.

Explosion and Pressure Recorder—The Mathot continuous explosion and pressure recorder is designed to register the variations in the explosions of gas and oil engines and the strokes of pumps, compressors, etc. In its simplest form it resembles a steam engine indicator with an additional drum of large diameter, driven continuously by clockwork, whose rate is adjustable, and may be as slow as 129 sceonds per revolution. Upon this drum is a "card" on which the pencil draws a continuous diagram. Ordinarily the length of diagram representing one cycle of a gas engine is very short—from one-eighth inch to one-fourth inch—and the explosion line is the most prominent feature of it. The variations of the explosion pressure are very marked. In another form of the recorder a band of paper several yards in length is used, and in that the speed of travel can be much increased so as to give open diagrams of a size comparable with those of the ordinary indicator. The circular lately sent out shows diagrams taken from the same engine before and after alteration had been effected in the suction passages, the exhaust pipes. the ignition tubes, and the like, the alterations having been suggested by the first set of diagrams, and the improvement demonstrated in the second. A cursory inspection of some of the diagrams reveals irregularities which could not be detected in an ordinary card. The appliance can be fitted to an indicator of the usual type.

More Large Chain.

What is said to be the largest chain ever made was shipped last week from the Lebanon, Pa., chain works to the Eastern Shipbuilding Company at New London, Conn. The shipment represents one-half of an order for 660 fathoms of three and three-sixteenths inch diameter iron, constructed in shots of 15 and 30 fathoms each, which are connected with three and seven-sixteenths inch shackles and swivels. Each link measures 19½ inches in length and about 11½ inches in width and weighs about 10 pounds to the foot. Four cars carried the chain, the shipment consisting of 10 shots of 30 fathoms and two shots of 15 fathoms each, weighing 186,730 pounds. The chain will be used on the new Hill steamers, which are to be used in the Pacific service.

Rushing the Car Plant.

Rapid progress is being made in the construction of the Standard Steel Car Company's plant at Butler. Gradings and foundations have about been completed and work on the construction of the buildings is going on. It is the company's intention to have the plant in operation by the middle or latter part of August. The equipment for the plant, which has been ordered for some time, will be on the ground by August 1.

The original intention of the company, based on a conservative estimate, placed the capacity of the plant at 50 cars a day. Mr. Hansen, president of the company, now estimates an output of from 65 to 75 cars a day, of which 25 will be wooden cars with steel underframes, with the equipment provided for in the original plan. The entire group of buildings will cover over 40 acres of ground, of which the main building, for the assembling of steel cars, will be 1600x240 feet and the wooden car department 400x160 feet.

Considerable ground has been secured, beside that upon which the plant is being built, and the buildings are being so constructed, to provide for an extension which it may be deemed necessary to make in the future.

W. L. Mellon, financier, and Henry Aiken, consulting mechanical engineer, both of this city, have become associated with the company, who with A. R. Fraser, John M. Hansen and H. J. Gearhart, of this city; L. C. Weir, president of the Adams Express Company, New York, and Edwin Hawley, president of the Iowa Central and the Minneapolis & St. Louis railways, form the board of directors.

Must Enlarge Plants.

J. W. Duntley, president of the Chicago Pneumatic Tool Company who has just returned from a trip through Europe, secured orders while abroad for an aggregate of 2,700 "Boyer" and "Little Giant" pneumatic tools, as well as for 25 "Franklin" air compressors, for early delivery. Mr. Duntley states that the Europeans now realize the absolute necessity of using labor saving tools to reduce the cost of manufacture and counteract the influence of the "American invasion" which is causing widespread alarm in commercial circles, and enable them to complete for the markets of the world.

The unprecedented increase in the sales of Chicago compound pneumatic tools in foreign ountries recently may be attributed in a measure to the cause above mentioned, and also to the fact that the opposition to pneumatic tools by workmen, on account of their labor-saving qualities, has been entirely overcome.

The company's plants are taxed to their utmost capacity, and will be greatly enlarged in the near future, to meet the increasing demand for the products.

New Conveyor Belt—As is well known, conveyor belts are in quite general use for moving material in industrial plants. Flat belts must be of considerable width, as they have been almost entirely displaced by a belt curved or dished to form a carrier of greater capacity. This has to be supported at intervals by guides, to keep the belt curved on the carrying run and flattened on each end to pass about the rollers. This continuous bending action on the belt deteriorates it, and to overcome the objection, James L. Dodge, of Philadelphia, has devised a new construction. The Link Belt Engineering Company, also of Philadelphia, has obtained control of the patent just granted on the improvement.

The inventor's idea is to make the belt of several section coupled at their abutting edges by hinges. The joint is formed of a coiled wire threaded through the abutting edges and permits the free swinging movement of the sections This arrangement does away with the necessity of strengthening the belt, and as the sections will readily give, they will flatten when passing around the head rollers without in any manner straining or injuring the sections.

Ordered to Pay Difference—The Commonwealth Iron Company, of Cleveland, has won the damage suit from the Salem Iron Company, in the United States circuit court in this city. The Cleveland company claimed that it entered into a contract with the Salem company to deliver 30,000 tons of Lake Superior iron ore. The Cleveland concern claimed that the Salem company repudiated the contract. The local company began suit to recover damages for the difference in the contract price, and the market value of the ore at the time the contract was entered into. The Commonwealth company claimed that it had been damaged to the extent of about $32,000. The jury returned a verdict for $31,989. It is understood that the Salem company will appeal the case.

The machine shop of the McKees Rocks Foundry & Manufacturing Company, at McKees Rocks, began operations Monday morning. The company was recently organized by a number of McKees Rocks business men to manufacture a newly patented hoisting jack and is capitalized at $50,000.

Wire and Nail Exports.

Over 7,000 tons of wire and wire nails were shipped to foreign countries through Eastern seaboard points last month. April exports were the largest for several months, and show an increase of nearly 50 per cent compared with the consignments during March. The wire shipments represented a total of 5,684 tons, the principle purchasers being Australia, which was forwarded one individual shipment of no less than 2,031 tons, South America and South Africa. The consignments to the Antipodes aggregated 2,566 tons in seven lots. To South America 1,143 tons were forwarded, Buenos Ayres having been sent 788 tons in four shipments, 320 tons in six lots going to Rio Janeiro, Montevideo and various Brazilian ports, the balance having been consigned to Chili. The shipments to South Africa amounted to 792 tons in eight lots. The wire exports made to Europe in April amounted to 484 tons, 302 tons going to the United Kingdom and 182 tons to Continental Europe. As regards shipments to Great Britain, the principal lot, 126 tons, went to London, while the balance was about equally distribtuted among the ports of Liverpool, Bristol, Leith and Glasgow.

The shipments to the Continent went to Rotterdam, Amsterdam, Christiania and Stockholm. Four hundred and one tons were forwarded in seven lots to Mexico; China and Japan ports were shipped 146 tons. Small shipments went also to Havana and Colon. The shipments abroad of wire nails last month aggregated, 1,689 tons. The far East and Great Britain were the largest buyers. Six hundred and fifty-eight, tons went in four lots to China and Japan ports including a single shipment of 336 tons, which was forwarded to Yokohama. To the United Kingdom 619 tons were shipped, Belfast, Liverpool, Bristol and Glasgow taking lots of over 100 tons each, while London, Manchester, Dublin and Leith were forwarded smaller shipments. One hundred and seventy-five tons went to Australia.

Other shipments were made to Odessa, Copenhagen, South Africa, Cuba, Chili and Manila.

Iron, Coal and Coke—The bureau of statistics reports that the United States iron trade for the first four months of this year furnished a tonnage of 657,670 tons, in contrast with 529,181 tons for the corresponding period of 1901. The home demand for pig iron from this quarter has almost extinguished exports. Out of a total shipment of 145,261 tons of pig iron in April, only 149 tons were credited to export from Southeren iron territory.

The coal trade since January 1 has generally exceeded that of the corresponding period of last year. Cincinnati gained 42.5 per cent. St. Louis shows an increase of 13 per cent. The Chesapeake and Ohio coal tonnage for nine months ending with March was 4,299,000. tons, compared with 3,918,172 tons last year. The coal and coke tonnage over the Pennsylvania lines East of Pittsburg and Erie reached a total of 11,837,998 tons to April 26 of this year, compared with 10,930,812 tons last year. Connellsville coke shipments this year averaged 10,747 cars a week, compared with 10,549 cars a week last year. Coal shipments to domestic ports on the lakes, mainly from lower lake ports were 930,096 tons this April, compared with 55,653 tons last April, while coastwise and foreign shipments for the first four months of the year amounted to 2,527,673 tons, of which 693,921 tons were hard coal, and 1,833,752 tons soft coal.

The iron ore shipments of 1,774,652 tons bring the tonnage of these two chief articles in lake trade to a total of 4,302,325 tons for the first third of the year.

Clinching the Merger—Circulars were sent out at the close of last week to the stockholders of the Sprague Electric Company, notifying them that an offer has been made by the General Electric Company to acquire control of the Sprague company. The circulars convey the information that the terms of the offer have been approved by many of the largest bond and stock holders, and that the merger practically is assured.

According to the circular, the General Electric Company will acquire the Sprague concern for an exchange of securities and a little cash. The options which the security holders of the Sprague company are requested to give, expire on July 10.

The capital stock of the Sprague Electric Company is given as $5,000,000. The General Electric Company recently increased its capital stock to $45,000,000. The absorption of the former concern practically leaves the manufacture of large electrical goods in the hands of two concerns, the Westinghouse and the Genera Electric.

A MATTER OF HISTORY.

The Chicago, Milwaukee & St. Paul Railway, popularly known as "The St. Paul Road," began the use of electricity for train lighting in 1888. In that and many ways it has been a poineer in the adoption of comforts for the traveler. In building the world famous Pioneer Limited trains a mark was set in luxury and beauty of cars that has never been equaled, and probably never will be.

Meeting the Demand Now.

About a year ago the Philip Carey Manufacturing Company's plant at Corsons, Pa., the largest and most complete plant in the world devoted exclusively to the manufacture of 85 per cent carbonate of magnesia coverings was destroyed by fire. It had been in operation only a few months but during that period the most exacting users of insulating materials in the country, among the most prominent of which was the United States government, who used a number of car loads of 85 per cent magnesia sectional and plastic coverings at the various navy yards, torpedo boats, battleships and government buildings throughout the country. In fact, at the time of the fire, the demand for Carey's magnesia sectional and plastic coverings, was so great that the plant, despite the fact that it was equipped with the most modern and improved facilities, was unable to take care of the business promptly.

Inability to take care of orders, pending the re-construction of the plant, caused more serious loss and inconvenience to both the American Magnesia & Covering Company, and their sole authorized distributors, The Philip Carey Manufacturing Company, of Lockland, O. The Corsons plant has been rebuilt on a more extensive scale, with all modern improvements and appliances, and the Carey company has for the past 60 days been furnishing customers through the Pittsburg branch and other offices, with 85 per cent carbonate of magnesia steam pipe and boiler coverings and are promptly taking care of all orders and contracts.

The Pittsburg branch of the Carey company is at No. 433-435 First avenue, where a full line of the products of the extensive factories is carried to meet contracts of any magnitude.

Billets Still Coming In—Additional importations of steel billets from Germany have arrived in this country. According to Pittsburg steel men they are intended for the consumption of independent interests. One Pittsburg steel-importing firm claims to have orders for 10,000 tons of billets, providing they can be delivered during the next few months. The prices range close to the domestic market, and with the premiums offered for early delivery, it is hoped to meet the home competition for the present. An advance in the prices of billets in Germany, however, is looked for at any time on account of the increasing demand from this country and the moment this takes place the importation will cease, as it will place the foreign market far above the domestic product.

Several Nice Contracts.

The George A. Hogg Iron & Steel Foundry Company, of this city, manufacturers of rolling mill and tin plate mill machinery, is running the entire plant night and day. Among the orders recently received, is a large contract from the Louisville Bolt & Iron Company, of Louisville, Kentucky. This order is for a 32x72-inch Aetna rolling mill engine; a 26x48inch Aetna rolling mill engine;. a 20-inch train for rolling sheet bars and consisting of there high pinions; three high roughing rolls and three high finishing rolls, a 48 inch squeezer; a 26 inch sheet train consisting of two hot mills and one cold mill and a 38-inch roll lathe. The company also recently received orders for a 38-inch roll lathe from the Maryland Sheet & Steel Company of Cumberland, Md., 24-inch roll lathe from Superior Steel Company, of Carnegie; a 24-inch lathe from the Cohoes Rolling Mill Company of Cohoes New York; and a 24-inch roll lathe from the Illinois Steel Company, of Joilet, Ill.

Increasing Their Capital Stock.

Many of the manufacturing concerns in the Pittsburg district have increased their capital stock, the following being a partial list:

Pittbsurg Malleable Iron Company $25,000 to $300,000; John Eichleay, Jr., Structural Steel Company, $1,000 to $100,000; Monongahela Foundry & Forge Company, $1,000 to $50,000; Pittsburg Construction & Engineering Company, $20,000 to $50,000; Hussey-Binns Shovel Company, $1,000 to $1,250,000; Petroleum Iron Works Company, Washington, $50,000 to $150,000: Veteran Coke Company, Greensburg, $1,000 to $125, 000; Follansbee Brothers Company, $300,000 to $800,000: Superior Steel Company, $100,000 to $500,000; Harris Pump & Supply Company $1.000, to $50,000; American Foundry & Construction Company, $1,000 to $150,000; Burns Uniform Steel & Metallic Company, $1,000 to $200,000. James H. Baker Manufacturing Company, Tarentum $1,000 to $500,000.

TRAVEL LIKE PRINCES.

Those who saw the special train in which H. R. H. Price Henry of Prussia made his tuor of the United Sates are comparing it with other trains in regular service, and it is admitted that none of the cars in the train compare favorably with the buffet, compartment and standard sleeping cars of the Pioneer Limited trains of the Chicago, Milwaukee and St. Paul Railway in daily service between Chicago, St. Paul and Minneapolis. The people of this country have the satisfaction of knowing that at any time they can not only travel like Princes, but can get much better service.

IN AND ABOUT PITTSBURG.

The Burns Uniform Steel & Metallic Company, recently incorporated, of this city, will let contracts this week for the construction of the crucible department of its plant to be built at Latrobe. The company has secured 40 acres of ground at Cassett station, near Latrobe, 20 acres of which is being prepared for the plant, to consist of an open-hearth department with four furnaces from 25 to 50 tons capacity, a rolling mill and a series of buildings for the crucible department to contain four 48 pot ranges. Both the crucible and open-hearth furnaces will be constructed differently from any now in use, being designed by James Burns who controls the process which will be employed in the manufacture of uniform steel. Different grades of steel will be produced in the crucible department to be used for tools, stay bolts, locomotive work, fine sheets, boiler plates, roofing etc. It is the company's intention to get the crucible department in operation before letting contracts for the construction of the open-hearth and rolling mill departments. The headquarters of the company are in the Lewis block, this city.

Efforts are being made to organize the Budke Iron & Steel Company, of Pittsburg, which it is intended to capitalize at $850,000. The new company proposes to build a plant near Shannopin, on the Pittsburg & Lake Erie railroad, which will manufacture sheet steel for high grade purposes, such as enameling work, etc. The plans for the plant include three roughing mills, six hot mills and four finishing mills. In addition there will be eight puddling furnaces. A plot of 157 acres has been optioned for the plant, a portion of which will be laid out for houses for the workmen

The Republic Iron & Steel Company has formally taken over the Atlantic furnace of the Atlantic Iron & Steel Company, of New Castle. The stock of the company was nominally the property of the Republic company since the organization, but according to an agreement entered into at the time, the furnace was to continue under the Atlantic Iron and Steel Company for a period, of two years. The time has expired. The furnace was blown out in April for repairs and will go into blast within a few days. The annual output is 95,000 tons of Bessemer iron. Charles Hart, district manager of the Republic Iron and Steel Company's furnace, will have charge of the Atlantic.

The Standard Bronze Company has been organized by John Hatzen, W. A. Cochran and E. S. Hale, of Braddock, who were formerly connected with the Braddock Machine & Manufacturing Company before it was sold to the Peacock interests. The company has located a site between Fifth and Sixth streets, Braddock, and will begin at once the construction of brass and bronze foundry, machine shop with finishing and polishing departments, power house and office building. The product of the plant will be brass and bronze castings and goods. The company will apply for a charter June 14 with $200,000 capital stock.

The S. Obermayer Company, manufacturers and dealers in foundry equipments and supplies, of Cincinnati, Chicago and Pittsburg, reports business in excellent shape with the outlook bright for a continuance throughout the year. The company established an office and warehouse at 35th and Charlotte streets, this city, in November of last year and reports business to date in this district to be far in excess of its expectations. There is carried in stock at the company's warehouses a full stock of supplies for immediate delivery, including ladles from 30 pounds to 10 tons.

The Audit Company of Pittsburg, organized in January of this year, has established its headquarters in two suites, of three rooms each, on the third floor of the Frick building, this city, where it will conduct a general auditing business in all of its branches, including the installation of cost systems, enabling manufacturers to ascertain the cost of product at each stage of manufacture, and the installation of modern systems of accounting. The company will also take entire charge of accounts in any business. Branch offices have been established in the leading cities of this country.

The Hostetter Coal & Coke Company, of Pittsburg, has concluded the negotiations for the purchase of 112 acres of Connellsville coal land, which is to be added to the present holdings of that concern. The property was owned by E H. Anderson and Mrs. Maggie Anderson, and it is said that the property is the last of the Connellsville seam that it is possible to buy. The price paid was $123,000.

A West Virginia charter was secured last week by the Pittsburg Copper Company, of this city, with $500,000 capital stock. The incorporators are H. D. Montgomery, S. L. Ruslander, Joseph H. Hill, F. E. Fairman and Charles M. Thorp of Weil and Thorp, attorneys, St. Nicholas building. The incorporators are all of this city.

The contract for a 32-inch blooming mill to be erected at South Chicago by the Deering Harvester Company, has been awarded to Mackintosh.

Hemphill & Company, of this city. Julian Kennedy has been retained as engineer for the plant. The plant will consist of 14 open hearth furnaces, each with a capacity of 40 tons; 8, 9, 12 and 16-inch merchant mills; 22, 26, and 28-inch plate mills, and 32 inch blooming mill.

Jones & Laughlins, limited, have given a contract for the construction of two acid openhearth urnaces in the Soho furnace plant of that company. The installation of the new furnaces is likely to be at about the same time as the general remodeling of that plant. The new furnaces will have a capacity of 25 tons each, per heat or combined 100 tons daily.

The Ellwood City plant of the American Tin Plate Company will likely close down next week for the purpose of making extensive repairs. The company has a large number of late orders on hand and in order that it may be in best possible condition to meet the rush has decided to close earlier than was contemplated.

Plans are being prepared by S. Diescher & Sons, Hamilton building, for the new plant of the Franklin Rolling Mill & Foundry Company, Franklin, for the manufacture of special shapes of steel telegraph poles, also malleable steel castings. Bids for the work will not be asked for at least for two or three weeks.

Wickes Brothers, manufacturers of and dealers in boilers, engines, pumps etc., of Saginaw, Mich., and Pittsburg, have bought property adjoining and in the rear of their Pittsburg office, and warehouse in Forty-fifth street, upon which they will put up a building for manufacturing purposes, plans for which are being outlined.

The Wiley Twist Drill & Tool Company is being organized by local men for the purpose of building a plant at Latrobe, for the manufacture of twist drills and other tools from "Burns" uniform steel. Interested in the company is S. Van Duzen, 707 Park building, this city.

The plant of the Seaman-Sleeth Company, of this city, is undergoing a remodeling. An extension of 90 feet is being made to the foundry and a number of jib cranes installed. A 250 horse power electric light is also being installed.

The Railway Steel Casting Company, recently organized, has decided against the site at Tarentum for its plant. The company is negotiating the purchase of land near New Castle and will call a meeting this week to decide.

The Vulcan Crucible Steel Company, whose plant is at Monaca, will add further improvements to the works to include a small bar mill an open hearth furnace and probably a rod mill.

NOTES OF THE INDUSTRIES.

Contracts will probably be awarded this week for the erection and equipment of the new pipe mill at Columbia, Pa., which was designed by Victor Beutner of this city. The main mill building will be 300x90 feet, while the threading shop will be 500x50 feet. The power house will be 180x50 feet and the producer house, which will contain eight water seal gas producers will be 140x30 feet. In the main building will be installed one lap weld mill for sizes from two to 10 inches, while the butt weld mill will produce pipe one-eighth to two inches. The entire plant has been so laid out that it can be duplicated at any time.

The annual meeting of the stockholders of the Mahoning Foundry & Machine Company, Youngstown, O., was held last week. The organization for the coming year was effected by the election of the following board of directors: Frank D. Rnmser, G. M. McKelvey, L. E. Cochran, Mason Evans and Frederick G. Evans. The directors organized by electing Frank D. Runser, president; Mason Evans, vice president; Frederick G. Evans, secretary and treasurer. The company's new plant will be completed and in operation by the middle of July, provided it is possible to get all the new machinery installed.

The Wright & Finnie Foundry Company, of Youngstown, has been incorporated, with a capital stock of $20,000, the incorporators being William B. Wright, James Wright, John W. Wright, Alexander Finnie and Margaret Finni This company operates a foundry in Youngstown opposite the Bessemer plant of the Republic Iron & Steel Company, known as the Riverside foundry, but could not be incorporated owing to the fact that there is already a company in Cleveland incorporated under that name. The plant is under the management of William B. Wright and Alex Finnie.

The firm of Scholl & Semple, Youngstown, O., has leased the present site and buildings of the Mahoning Foundry & Machine Company adjoining the tracks of the Erie railroad, and expect to take possession in July. When the new site is taken possession of the work of placing new machinery and equipment for conducting a general high pressure steam fitting business upon a larger scale than heretofore.

The Wheeling Bridge & Construction Company, Wheeling, W. Va., has called a special

meeting of the stockholders for June 3, the object being to increase the number of directors from seven to nine. Work is progressing rapidly on the company's plant and the officials expect to have it in operation by October. At the last meeting of the board of directors contracts were closed for the machinery equipment, and Manager Barrett was instructed to purchase 1,000 tons of structural material.

The West Carnegie Sheet Steel Company of this city, which will build a large plant near West Carnegie, has awarded to the Pittsburg Construction Company the contract to do the grading and putting in the foundations. Edward E. Erickson, of this city, has the contract to erect two 25-ton basic open-hearth steel furnaces. A sheet mill is also to be erected. The American Bridge Company will furnish the structural iron.

The Moscow Georges Creek Mining Company was incorporated May 26 with $150,000 capital, and will at once begin the development of a coal tract near Barton. William A. Somerville of Frostburg, through whom the purchase was made; Archibald F.B. Somerville, A. L. Schultz of Pittsburg; John S. Askey, Hugh Scott and Clinton Brotemarkle, of Lonaconing are the directors.

The Wellman-Seaver-Morgan Engineering Company, Cleveland, O., will build a foundry on the West side of Giddings avenue near Central avenue. The foundry will be of brick and steel construction. It will be built in three sections, the largest of which will be 73 feet in idth and 300 feet in depth. The building will cost $34,000

The Garry Iron & Steel Company, Cleveland, O., has the contract for steel work for the new foundry buildings for the Wellman-Seaver-Morgan Engineering Company, on Giddings avenue, near Central avenue, Cleveland. These buildings are 64 x 80 feet and 37 feet high; 73 x 300 feet and 45 feet high, and 37 x 300 feet and 30 feet high.

General E. Burd Grubb, of Edgewater Park, N. J., has sold to the Lebanon Valley Furnace Company his interest in the Cornwall iron ore banks, at Lebanon, Pa., for $112,500. The company also bought the Lebanon Valley furnace from General Grubb, John Meily and Richard Meily, for $112,500.

McCann & Lebleing, Greensburg, have received the sub-contract for the building of 600 coke ovens on the Tug river, in West Virginia. The contract was let to Bennett & Wrakman for 1,200 ovens by the Illinois Steel Company, the whole to cost, it is said, something over $500,000.

Plans are being prepared by Milliken Brothers, bridge builders, of Brooklyn, for a large extension to their plant, which will greatly increase the present output. Their business is scattered throughout the world, a large per cent of the output being for foreign shipment.

William Steel & Sons, Philadelphia will build a factory for the North Brothers' Manufacturing Company on the East side of North American street above Lehigh avenue, Philadelphia. It will be a five-story brick structure 173x40 feet, and will cost $45,000.

An application has been made to the Blair county, Pa., court for the appointment of a receiver to wind up the affairs of the firm of Edwin R. Baldridge & Company, engaged in quarrying and shipping limestone in Blair and Huntingdon counties.

Henderson & Company, Philadelphia will build a one-story brick foundry, 74 by 160 feet, for the J. G. Brill Company, car manufacturers, of that city. The cost of the work will be $10,000.

Coleman Furnace, No. 1, at Cornwall, Pa., has been blown out of blast to make repairs.

Arrangements are being made to take down the machinery and buildings of the American Bridge Works, New Decatur, Ala., and move the same to Anniston, where it will be converted into an iron manufacturing plant of some kind.

The first dividend on Dominion Coal common stock will be paid in July and will amount to 2⅝ per cent. Dividends thereafter of two per cent each quarter will be paid, making a total of eight per cent per annum.

The Globe Foundry & Machine Company's plant at Niles, O., is not large enough for the business and it is probable that the company will build a large works in another part of the town.

The merger of the Dominion Coal Company with the Dominion Iron & Steel Company has been ratified, the former being taken over by the latter under agreement dated March 1.

The John A. Roebling's Sons Company, Trenton, N. J., has announced an increase of wages to its employes averaging 10 per cent. The increase is a voluntary one.

The plans for the new blast furnace to be built at Haselton, O., by the Republic Iron & Steel Company are being prepared by Chief Engineer Willis McKee.

A one-story brick addition, 74x164 feet, is to be built to the car works of the J. G. Brill Company, Philadelphia.

The National Electric Lamps Company, Cleveand, O., will repair its factory building and ad new machinery.

WEST VIRGINIA NOTES.

Josepn Bond and J. W. Cox, of Weston, have optioned 10,000 acres of coal to the Elkins-Davis syndicate for three months. The company paid $5,000 to hold the option which it is believed was taken for $1,000,000, and expires in three months. The activity of the syndicate in connection with the movements of the Wabash railroad's agents in this state portend developments of the most important character. It is believed that the Elkins-Davis people, in anticipation of the early construction of the Wabash have optioned or prepared to buy outright millions of dollars worth of coal.

The Wheeling Steel & Iron Company has arranged with Victor Beutner, engineer, Westinghouse building, Pittsburg, to draw plans for a water pumping station at its Benwood works, costing $50,000. The company's new tube mil. at Benwood is fast nearing completion and will be in use within the next few months.

F Teter, J. A. Vequesky, L. B. Lovett, and H.H. Jones, of Belington and C. F. Teter, of Phillipi, W. Va., have organized the Belington & Alston Light & Water Company, of Belington for the purpose of constructing water and electric light plants; capital $100,000.

The Blaine Mining Company, of Davis, W. Va., has been organized by T. B. Davis, Jr., of Davis, W. Va., W. P. Young, of Somerset, Pa., and others, stock $50,000. Company will do mining and coal business.

Bellaire and Wheeling parties have bought the Franklin mines with 1,300 acres of coal a short distance from Bellaire on the B. & O. The mines are among the oldest in Eastern Ohio.

Clarksburg proposes to build new steel bridges across Elk river. The board of trade will likely ake up the matter.

The B. & O. is scouring the country for experienced machinists. It is said to have places for 800 men.

Coaling Station at Manila.

One of the most potent factors in the government policy of holding the Philippine islands was the advantageous position of Manila harbor as a coaling station for war vessels in the Eastern waters. The naval engineers decided that Sangley Point would be the best location for large coal pockets and coal handling machinery.

Extensive wharves and fire proof buildings are being erected for this purpose. Two coal sheds are each 194 feet wide and 300 feet long with an interval of 50 feet between them, while the wharf is 418 feet in length and 75 feet wide.

The coal handling machinery was designed to remove the coal from colliers by means of hoisting towers and distribute it in the storage sheds by automatic railways; also to coal the war vessels at the wharf from the shed. To do this to best advantage required two steeple towers equipped with steam hoisting engines and duplex steam shovels, twelve automatic rails and over a mile of track. All this coal handling machinery together with accessories such as railway equipment, cars, coal tubs, etc., is being built by the C. W. Hunt Company, New York.

Recently 36 flat top four-wheel cars were completed and shipped to the Philippine islands. Each car is of one ton capacity to be used on the Hunt industrial railway. Standard gauge for this railway is 21½ inches, out to out of rail heads. and is admirably adapted for transporting material on wharves, ware houses, docks and shops.

Will Need New Machinery—The West Virgina Plate Glass Company has been organized by Pittsburg and Morgantown men. Plans are be_ ing prepared to build a large plate glass factory in the vicinity of Morgantown. The Pittsburgers are F. S. Brockett and L. B. Brockett. A site for the new factory hsa been donated the company and arrangements for a supply of natural gas fuel has also been completed.

The capital of the new corportation has been fixed at $1,000,000 and in addition to the plate glass factory, the company will, under subsidiary corporations, operate limestone quarries and glass sand veins that are near the factory site.

MILLIONS IN GOLD

BROUGHT FROM ALASKA DURING THE YEAR 1901

Over seven millions came from the Nome district alone. Government officials estimate the output from the Nome district will be doubled the coming season. The Bluestone, Kougarok and Pilgrim Rivers have been found very rich- There is hardy a creek from Port Clarence, Norton Sound in which the precious metal is not found, with hundreds of creeks not prospected yet.

For information regarding routes, steamship accommodations and rates to poinst in Alaska, address C. N. Southern, General Agent Passenger Department, C. M. St. P. Ry, 95, Adams street, Chicago.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The markets are passing through a stage of comparative ease, mainly because there is so little buying and selling and consumers have a chance to see that there is not so much cause for fear as they supposed. It is becoming clearer every week that there is no occasion for shying at the market and plunging into next year's tonnage. There will be enough material to go around even if a few are caught short temporarily. The few who allowed themselves to get frightened because of the conditions they imagined would rule the markets late this year and during the early portion of 1903, have about recovered from their scare. The tendency toward buying for next year has about retired from the situation.

The report that the United States Steel Corporation is negotiating for another big tonnage of Bessemer pig for delivery during the second quarter of next year cannot be verified and is most probably fiction. The second quarter of 1903 is quite too far ahead for such a big purchase and none of the sellers of standard Bessemer admit a knowledge of the "negotiations" for the tonnage. The merchant blast furnace interests of the valleys the most likely producers of the tonnage which the Steel Corporation is said to be on the point of buying, denies all knowledge of the transaction and in addition express the belief that the rumor has no actual foundation. The story most likely had its origin in the function of the press agent whose object was to strengthen the finished steel market for the time said to be covered by the pig iron purchase.

While, prices are moving upward steadily there is so much of the year's capacity sold under the low prices as to minimize the dangers in the case. It may happen that the conditions might be reversed during the last weeks of the year permitting danger to come in boldly through the way of too high prices. As the case stands, now, however, there is not enough material of any kind being sold at the top prices to affect the real markets and there will not be enough available iron or steel for the remainder of the year to permit much of any change. This will at least postpone the danger until the very close of this year or the opening of 1903. Producers of iron and steel however are willing to sell for next year's delivery at the ruling figures of today so that if consumers really want material for early delivery next year they need not risk the higher prices of that time but may buy now. And the mere fact that the consumers are losing their fear of the prices and conditions of matter for next spring indicates that the prices ar about as high as they will go. And it must be borne in mind so far as this year is concerned that while prices for iron and steel are high now the greater portion of the tonnage was sold at a real low figure.

The latest quotation for standard Bessemer at the valley of merchant furnaces is $21.50 and $22 per ton. Mill iron is practically at that figure while No 2. foundry for spot delivery runs higher, the exact figure determined by the necessities of the buyer.

Billets are firm at $35 and $36 per ton.

Higher prices are indicated for some of the finished steel products before long but the changes will merely conform to the existing conditions of the market which point out a higher value than the low basis of last spring.

CURRENT QUOTATIONS:

Basic	$20 50	22 75	Splice bars	1 50	
Bessemer		22 25	Angles	1 60	
Charcoal, hot	$2 00		I beams	1 60	
Charcoal, cold	32 50		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 70
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	36 00		No. 1 cast	17 00	17 50
Open hearth	37 00		Iron rails	25 00	24 00
Steel bars	1 80		Car wheels	18 00	19 00
Iron bars, refined		2 10	Cast borings	10 00	10 50
Light rails		37 00	Turnings	18 00	14 00
Standard sections	28 00		Sheets, 26	3 00	
Bolts, iron, sq nut	2 50		Sheets, 27	3 10	
Hex nuts	2 65		Sheets, 28	3 20	
Spikes	2 00				

Philadelphia—The week, as regards iron and steel has been of the same general character as the one preceding. Prices have been strong all along the line, and in some cases distinct advances have been made, with no indication of a reaction anywhere. Such a contingency is, in fact, almost beyond the reach of possibility for some time to come. Mills and furnaces are so far sold ahead that a complete cessation of the demand need not affect values for a while. Practically all the tonnage now ordered is for delivery during the last half of the year. An immediate effect of the anthracite coal miners' strike has been to cause an increased demand for coke, and it is evident some of the furnaces that run on anthracite will change to coke, if the latter can be obtained. A partial restriction of the output of pig iron as a result of the strike is certain. The steel market is not specially active, mostly for the reason that nearly all the leading interests need their steel output for themselves, and are, therefore, not in the market as sellers. A good deal of foreign steel is

being sold for delivery in the Pittsburg district and further West. The scarcity of finished iron and steel products continues, and round premiums are being paid for early shipment.

Prices in the local pig iron market are extremely difficult to follow, and the only safe statement that can be made is that they are higher. Some sales have been made at as high as $22 for No. 2 foundry for immediate shipment, though $21 and $22.50 would probably be nearer to the exact prices; but all depends on how urgently the iron is needed and how quickly the shipment can be made. The range of prices for Philadelphia and nearby points for the standard brands of Northern iron is about as follows, subject to a premium of 50 cents or more for prompt shipments: No. 1 foundry, $20.50 to $21.50; No. 2 foundry, $20 to $20.50; gray forge, $18.50 to $19.

Domestic steel billets are so scarce as to be practically unobtainable, although it is claimed that buyers would pay $34, and even more than that, if deliveries could be made with reasonable promptness. Foreign steel is being offered at $30. ex-ship.

The demand for manufactured iron and steel is as active as ever, and deliveries just as hard to get as at any time during the year. Prices are firm all along the line, and for guaranteed prompt deliveries special prices have to be paid. It would be superfluous to go into details, as the conditions are in no respect different from what they have been for some months past; neither is there any prospect of change in the near future. The general list of quotations, represent both extremes of the markets.

CURRENT QUOTATIONS:

Foundry, 1	$20 50	21 50	Girder rails	32 00	32 50
Foundry, 2	20 00	20 50	Angles, 3" & lr'gr		1 8
Gray Forge	18 50	19 00	Under 3-inch		1 90
Bessemer billets		34 00	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown & Company—The business in pig iron continues to be confined to summer and fall deliveries, and as offerings are extremely light, the volume of business is restricted. Most of the furnace companies are offering nothing at all, even declining business from old customers in urgent need. When it is considered that orders thus declined are at prices ranging from $3 to $5 per ton more than the average realized on the old orders, it can be seen that furnacemen put the performance of contract obligations ahead of the consideration of profit.

The anthracite strike will, if prolonged materially curtail the output of pig iron in the Lehigh and Schuylkill districts. Furnaces there are accustomed to use about two-thirds coal and one-third coke. These proportions have been reversed since the strike commenced, but coal can not be dispensed with entirely, in many cases the plants not being equipped for use of all coke. One or two furnaces have been blown out, and each week the strike continues will see two or three more added to the idle list. Coming at a time when every carload made is urgently needed by the foundries and mills, this curtailment is very unfortunate.

Considerable relief is had along the Eastern seaboard by the importations of Scotch pig. The tendency of prices in British markets, however, is upward, and freights are also stiffening. The various steel products are also coming in in increasing volume. But for foreign supplies, consumers in the East would be in especially bad way.

There is little, if any, change in prices. Fancy figures are heard for small lots for immediate shipment, but the weight of influence of all large makers and sellers is against any further advance in prices. No interest is taken yet in next year's business, but when it is conclusively shown that the capacity for this year is oversold, transactions for the first part of next year will begin.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$20 65	21 00	Angles	2 00	2 50
No. 2X fdy Jersey City	21 50	22 50	Tees	2 00	2 50
No. 2 plain Jer. C	19 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	22 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	21 00		Com. base, bars per 100 lbs	1 65	1.70
No. 3 fdy N. Y.	20 50		Refined base, bars	1 85	1 90
No. 1 soft	17 75		Bands, base	2 40	2 50
No. 2 soft	18 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	28 00
			Wrought turnings deliv. at mill	11 50	12 00

Chicago—Inquiries for pig iron at Chicago from Eastern points, usually beyond the limits of this market, have been frequent within the past week or two. Some of these inquiries are responded to with quotations that result in sales, perhaps the majority do not. The situation at this city is much the same as a week ago, both in prices and in relative supply and demand. The latter keeps slightly in excess of the former and the tone of the market is quite firm. Current transactions are mainly for deliveries during the final quarter of the year. They include one for 5,000 tons, one for 2,000 tons and a considerable number for smaller tonnages. Supply is somewhat

crippled by a disaster to one of the local furnaces, and as a rule sellers are behind in their orders.

There is promise that the shutdown of Western implement concerns between the old and the new years this summer will be very brief. Already the manufacturers are specifying for July shipments of iron and steel material. The delays is shipments is the primarily reason for this early specification, but its volume indicates a good year to come. The numerous extensions to plants that have largely been made is favorably effecting the quantity of metal consumed. From store plates are higher. Bars are selling in fairly good tonnage, connsidering the tremendous business in March. Merchant steel is strong and active. Rails are selling in moderate amounts for the first quarter of 1903 and billets would be active were there any for sale.

There is a little further strength shown in old material, especially for borings and turnings. For relaying purposes, steel rails are very much in demand. Generally quotations for scrap show little change.

CURRENT QUOTATIONS

Bessemer	22 00	23 00	Sheets, 26 store....	3 25	3 40
Fdry Nohn 1 ...	21 50	22 50	No. 27	3 35	3 50
Northern 2. ...	21 90	22 00	No. 28..........	3 45	3 60
Northern 3. ..	20 50	21 50	Angles	1 75	
Southern 1 ..	20 65	21 65	Beams	1 75	
Southern 2	20 15	21 15	Tees	1 80	
Southern 3 ...	19 65	20 65	Zees	1 75	
Forge	19 15	20 15	Channels	1 75	
Charcoal	22 50	23 50	Steel melt'g scrap	18 00	18 50
Billets, Bessemer..	34 00	36 00	No. 1 r.r. wrought	20 50	21 00
Bars, iron ...	1 85	1 95	No. 1 cast, net ton	15 50	16 00
Bars, steel ...	1 75	1 85	Iron rails	24 00	25 00
Rails, standard ..	28 00		Car wheels..........	20 00	21 00
Rails, light	34 00	40 00	Cast borings........	10 00	11 00
Plates, boiler	1 90	2 00	Turnings.	13 50	14 00
Tank	1 75	1 80			

Cincinnati—Some fair-sized contracts have been closed for deliveries of pig iron during the last half of the year, and the immediate wants of consumers for small and medium sized lots have been freely supplied. This movement has been altogether at prices established early in the week, which were upon a basis of $16.00 Birmingham, for No. 2 foundry. Late in the week there was another advance of 50 cents per ton, but there has not been any business on the higher basis.

Recently there has has been quite a respectable quantity of odd lots for quick shipment, and these have been welcome, as they enabled consumers who were in immediate need to get out of their difficulties. For the next few months there is no question that the overwhelming majority of foundrymen have enough iron bought to cover their wants. But there have been some delays in delivering iron on contract time, and these have made consumers here and there short of metal.

The demand for finished iron and steel is as urgent as ever, mills being quite unable to cope with all the work that is offered to them. Orders have therefore to be scaled down or postponed, which in many cases involves serious troubles to those who have large contracts under way. Quotations are nominally unchanged but in most cases considerably more is necessary to secure anything like reasonable attention.

There is a great scarcity here of pig iron, and while the advance of 50 cents a ton last Friday was met readily by buyers, the probability is there will be a like advance this week, and more in the future, for iron is bound to be higher.

CURRENT QUOTATIONS

South. fdy. 1........	19 75	$20 0	Standard Sections	29 50	[illegible]
South fdy. 2........	19 25	19 50	Sheet, 26..........	3 [illegible]	
South fdy. 3........	18 75	19 00	Sheets, 27	3 50	
South. fdy. 4........	18 25	18 50	Sheets, 28..........	3 60	
Grey forge...	18 25	18 50	Angles, 3 to 6 in...	1 70	
Mottled..........	18 25	18 50	Angles, 1½ to 2...	1 82	
Sou. 1, soft........	19 75	20 00	Beams and Chan'l		
Sou. 2, soft........	19 25	19 50	15 in and under..	1 70	
L. Superior, fdy 1	22 00	22 50	I b'ms 18, 20 24 in...	1 80	
L. Superior, 2 ...	21 00	21 50	Tees	1 75	
L. Sup'r char'l c w	22 00	23 00	Z s	1 70	
Hang'g r'k c'l, 1 ..	26 00	28 00	I wrought scrap...	19 0	[illegible]
Sou. n c'l c w. ..	20 35	20 60	Steel melting stock		
Jakson cy. silvy 1 ..	2 50	22 00	gross ton..........	14 00	
St'l bs. base bl'f ex	1 72		No. 1 cast..........	18 00	
Iron bars..........	1 92		Old iron rails g t'n	22 00	
Flange plates......	1 80		Old car wheels.....	20 00	
Tank steel.	1 70		Cast borings	6 50	[illegible]
Ordinary fire-box.	1 90		Turnings..........	12 00	
Light rails..........	39 00				

Birmingham.—With the passage of another week the Southern iron market has still further strengthened. No. 2 is selling now at from $17 to $17.50. Transactions are not large at that figure except with the smaller concerns, which appear to have more spot iron than the large ones. The action of the Sloss-Sheffield Steel & Iron Company in announcing that it was selling No. 2 at $16 per ton two weeks ago has resulted in the absolute unbridling of the market and there is no set figure. Small consumers in Birmingham are paying $17 per ton for No. 2 right along and appear to be glad to get it at that figure. Grey forge is bringing $15 per ton and sometimes more than that, but $17 to $17.5 for No. 2 is the general basis. The leading event of the week was the announcement on the part of the Seaboard Air Line that it is coming to Birmingham. This road has bought the East and West of Alabama, which brings it within 30 miles of Birmingham and has surveyors in the field plotting out the route to this place. The road expects to be running trains between Atlanta and Birmingham within a year. Rights of way over streets of the city and other franchises were granted by the city council and everything necessary for the coming of the road facilitated. It has been known for years that the seaboard was coming to Birmingham, but there were constant delays. Now every difficulty has been removed and the road will hurriedly fill the gap between the East and West and this city. In addition to providing Birmingham

district with another trunk line to the East, the Seaboard will open up one of the most valuable virgin ore and coal districts in Alabama. Its coming into Alabama is one of the most significant events of the past five years. All industrial plants are enjoying a larger demand for goods than they can supply. From the steel plant of the Tennessee Coal, Iron & Railroad Company at Ensley to the soil pipe plants all are busy.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn.....	$17 50	18 00	Tank.....................	1 80	
No. 2 fdy, Sohn.....	17 00	17 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn.....	16 00	16 50	No. 1 wrought......	14 00	
Grey forge, Sohn..	15 50	16 00	No. 1 cast.............	12 00	
Billets..................	28 00		Iron rails.............	16 00	
Iron bars.............	1 70		Car wheels...........	15 00	
Steel bars.....	1 70		Cast borings.........	6 00	
Light rails............	38 00		Turnings.............	6 00	
Angles..................	1 75		No. 26 sheets.........	3 0	3 50
Boiler plates.........	1 90		No. 28 sheets.........	310	3 50
Fire box..............	2 00				

Coal.

Pittsburg—The car shortage is almost as severe this week as during the worst of the congestion last winter and the movement of fuel is extremely limited both to lake points and local industrial establishments. The railroads are busy making promises again but the conditions do not improve.

Cleveland—The coal shippers are getting desperate. Their coal has been coming forward very slowly, and it is safe to say that in some instances receipts to date have been no more than 25 per cent of the requirements. Such a state of affairs being continued very much longer will bring about such a scramble toward the latter part of the year as has never been seen before. The coal shippers now are powerless. The scarcity of coal gives them no leverage on the market, because they do not have enough to make a fight with, hence no reduction of rates seems possible. This has sent the coal shippers after the railroads during the last week, and they have talked out in meeting in no uncertain way. The railroads have made promises, but so far their fulfillment has been very faulty.

Chicago—The coal situation in the West is very much mixed. Opposite conditions exist side by side. Some West Virginia products are unusually scarce, due to a drainage of produce Eastward, other coals from the same state are quite abundant, because of a better car supply equipment used in the anthracite trade being diverted to the bituminous trade in some instances. Western coals are in excessive supply with prices weak. There has been some little buying and stocking in anticipation of a strike in the bituminous fields, but at this writing there has not been enough of the buying to affect the market. Generally speaking Eastern producers are neglecting the Western all-rail movement and speeding their output up the lake.

Cincinnati—There has been a very little movement but the market has been firm and closes in that condition. Pittsburg afloat is held at seven cents per bushel and Kanawha at 6½ to 7 cents afloat. Prices to consumers are as follows per ton of 2,000 pounds delivered: Pittsburg, $2.75; Kanawha, $2.50 to $2.75; smokeless, $3.00; and anthracite, $7.00.

Coke.

A summary of the Connellsville region for the week shows 20,618 ovens in blast and 668 idle.

The following figures show the scope of operations.

Production for the week	243,977 tons.
" last week	242,275 tons.
Increase	1,702 tons.
Shipments—	
To Pittsburg and river points........	3,401 cars.
To points West of Pittsburg........	5,944 cars.
To points East of Everson............	2,535 cars.
Total	11,889 cars.
Last week	12,103 cars.
Shipments in tons for week........	247,569 tons.
" " " last week........	254,163 tons.
Decrease	6,594 tons.
Masontown Field	
Shipments for week	678 cars.
" last week.................	562 cars.
Increase......................	116 cars.
Shipments in tons......	17,628 tons.
" last week.................	14,612 tons.
Increase	3,016 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha $4 60 Stonega, $4.60

Wire and Nails.

Wire, plain, car lots, jobbers..............................	$2 50
Galvanized, car lots, jobbers..............................	2 45
Wire, plain, less than car lots, jobbers..............................	2 15
Galvanized, less than car lots, jobbers..............................	25
Wire, plain, car lots, retailers..............................	2 15
Galvanized, car lots, retailers..............................	2 55
Wire, plain, less than car lots, retailers..............................	2 20
Galvanized, less than car lots, retailers..............................	2 70
Wire nails, car lots, jobbers..............................	2 05
Wire nails, less than car lots, jobbers..............................	2 15
Wire nails, car lots, retailers..............................	2 15
Wire nails, less than car lots, retailers..............................	2 25
Cut nails, car lots, jobbers..............................	1 10
Cut nails, less than car lots, jobbers..............................	1 15
Cut nails, car lots, retailers..............................	1 23
Cut nails, less than car lots, retailers..............................	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut..............................	10.75	c
Copper, light bottoms..............................	9.50	c
Heavy Composition..............................	10.75	c
Brass Turnings..............................	7.00	c
Heavy Brass..............................	8.62½	c

Light Brass	7.87½	c
Heavy Lead	3.90	c
Tea Lead	3.70	c
Zinc Scrap	3.12½	c
No. 1 Pewter	19 00	c

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 901 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4 75

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including May 26, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	745,656	389,460
Tidewater	261,460	84,023
Southwest	49,813	242,244
Eureka	28,656	854,987
Buckeye, Macksburg oil	6,957	356,583
New York Transit	631,781	
Southern	660,188	....
Crescent	147,713	....
Total	2,552,336	1,935,584
Daily averages	102,093	77,423
Buckeye / Indiana Local Division	1,284,100	1,287,296
Daily average	51,861	51,492

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
May 21	$1.35	$1.20	$1.20	$0.88	$0.83	$0.83
May 22	1.35	1.20	1.20	0.88	0.83	0.83
May 23	1.35	1.20	1.20	0.88	0.83	0.83
May 24	1.35	1.20	1.20	0.88	0.83	0.83
May 26	1.35	1.20	1.20	0.88	0.83	83
May 27	1.35	1.20	1.20	0.88	0.83	0.8

Ore Situation at Cleveland.

The delay to the ore boats has become almost exasperating to the owners, and some of them are seeking in vain a proper redress for their grievances. Two years ago boats were getting out of this port in two days. Now the average time for a boat in port is five days under the most favorable circumstances, but vessels are more often delayed seven than five. It was figured last week that delays so far this year have amounted to 33 1-3 per cent of the tonnage on the lakes. In other words three boats are doing the work which two could, or if the present delays were carried through the season, a fleet which can carry 21,000,000 tons of ore would be able to bring down only 14,000,000. But the tide must turn sooner or later, and when it does, the shippers will pay the fiddler. The delays to date have already overcome in large measure the early start which the boats made, and before long the addition to the tonnage of the lakes during the season will be eaten up. The big business of the year is likely to be jammed into the period between July 1 and the end of the season.

Under the circumstances the month's shipments will be watched with more than ordinary interest. Many are striving vainly to explain the delays which are occurring. The cars, of course, are woefully short, which seems impossible with the knowledge of the addition to the railroad equipment that has been made of recent months. The fact is not overlooked, however, that while this equipment was being built the old engines were hammering themselves to pieces with over work, and instead of the new ones being additions, they are in many instances simply taking the place of the worn out locomotives. The new machines amount to renewals, therefore, and make no appreciable increase to the motive power of the roads. The situation has seldom been more discouraging to some interests at the outset of the sesaon.

A plant to manufacture electric railway supplies is a prospective Pottstown, Pa., industry.

The Vesta Furnace, at Vesta, Lancaster county, Pa., is soon to be put in blast.

The Metal Markets.

LONDON—Tin—£137-£131 15s. Sales, 530 tons spot; 610 tons futures.

Copper—£55-£45 1s 6d. Sales, 775 tons spot: 1,675 tons futures.

Lead—£11 12s. 6d-£11 10s.

Spelter—£18 10s.

NEW YORK—Tin—$30.12½-$29.95.

Copper—Lake, $13.00-$12.37½; electrolytic-$12.75-$12.12½; casting, $12.50-$12.00.

Lead—$4.15.

Spelter—$4.75-$4.55.

ST. LOUIS—Lead—$4.15-$3.97½.

Spelter—$4.50-$4.35.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c.
100 lb. " ....35c. "	ton lots and over......33c.

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb.
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.85 per lb., in small lots; lot of 100 pounds, $1 10 per lb.: special price on large lots

Patents.

The following patents granted May 20, 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Furnace for burning fine fuel, Richard Herzberg, Stettin, Germany; steam condensing system, J. D. McRae, Oswego, N. Y.; centrifugal pump, same; internal combustion engine, W. J. Robb, Portadown, Ireland; rotary explosive engine, S. S. Rose, Amador City, Cal., water-tube boiler, J. A. Scott, Yonkers, N. Y.; means for lubricating hydrulaic cylinders, L. G. M. West, Baltimore, Md.; gas impact engine, Lida Wilson, Brooklyn, N. Y.; four-stroke petroleum motor, H. A. Bertheau, Stockholm, Sweden; steam turbine, J. H. Fedeler, New York; steam generator for locomotive service, C. H. Fox, Cincinnati; stopper for boiler tubes or hollow shafts, H. T. Mason, Chicago; manufacture of steam generator shells, cylinders, etc., B. F. McTear, Rainhill, England; machine for making seamless tubes or hollow articles, same; speed regulator for explosive engines, R. A. F. Beilfuss, Lansing, Mich.; rotary engine, B. D. Hobbs, Edwardsville, Ind.; lehr for annealing plate glass, also glass delivering apparatus, W. D. Keyes, Blairsville, Pa. (2); feed water regulator, C. M. Spencer, Windsor, Conn.; rotary motor, Hugo van Beresteyne, Brussels, Belgium; compound or multiple cylinder engine, Isaac Kling, Louisville, Ky.; blast furnace, F. C. Norcross and James Mitchell, Lorain, O.; rotary engine, T. J. Perrin, Koshkongon, Mo.; smoke consuming furnace, C. M. Barnard, St. Louis; mining machine, H. B. Bierdorff, Columbus, O.

A NEW DEPARTURE.

The Chicago, Milwaukee & St. Paul Railway has recently put in service on its Pione r Limited trains the largest and handsomest dining car ever built. It is 82 feet in length from tip to tip, and its body is 6 inches wider and higher than the usual dining car. It seats 36 people comfortably in movable chairs, and has a kitchen large enough to permit the working of six cooks which with six waiters and conductor make up the crew. The dining cars heretofore in service did not provide sufficient space to properly care for the large number of patrons of the Pioneer, so that it became necessary to have a larger car.

Railway Spring Details—Details of the deal whereby the Railway Steel Spring Company will acqnire The Steel Tired Wheel Company have been officially published. There is involved an increase of $7,000,000 in the capital stock of the Railway Steel Spring Company, which will be used to acquire all the assests of the Steel Tired Wheel Company through the acquisition of the later's outstanding stock. The Steel Tired Wheel Company is engaged in the manufacture and sale of steel tired wheels and owns free of encumbrance plants fully equipped for its business at Hudson, N. Y.; Scranton, Pa.; Pullman, Ill.; Denver, Col.; Chicago and Cleveland. It has in addition quick assets, consisting of c, aashspproved accounts and bills receivable, material and supplies of the value after deducing current bills, of $1,390,071.83.

A special meeting of the stockholders of the companies will be held on Tuesday, June 3, to approve the agreement. The transfer books of the Railway Steel Spring Company will close on May 13 and will reopen June 4. Interests of the two companies already are very close,. Julius French is president both of the Railway Steel Spring Company and the Steel Tired Wheel Company. He said today the principal object of the consolidation is mutual economy.

Have Received Charters—Papers of incorporation have been granted to the following Pennsylvania concerns: Brush & Stephens Company, Pittsburg, capital, $1,000; Walrus Company, Pittsburg, capital, $15,000: Consolidated Coal & Iron Company, Punxsutawney, capital, $150,-000; Indiana County Coal Company, Punxsutawney, capital, $250,000 Schuylkill Valley Gas Company, Pottsville, capital.$5,000; Beaver Valley Pot Company, Rochester, capital $25,000; Perrsyville Electric Company, Mifflintown, capital, $1,000; Patterson Electric Company, Mifflintown, capital, $1,000.

Special Excursions

Via Chicago, Milwaukee & St. Paul Railway to Pacific Coast points, for which tickets will be sold from Chicago April 20th to 27th, May 27th to June 8th, July 16th to 21st and August 2d to 8th, good sixty days. To Colorado and Utah points tickets will be on sale during June, July, August and September good to return until October 31, 1902. Homeseekers excursion tickets are sold on the first and third Tuesdays of each month to points West and Northwest of Chicago, good twenty-one days. For particulars call on or address John R. Pratt, District Passenger Agent, Room D, Park Building, Pittsburg, Pa.

Bought Ohio Coal Lands—The Western Coal & Coke Company has purchased a controlling interest in a tract of 400 acres of coal land at Miller, Wayne county, O., on the Panhandle. The former owners were George F. Huff, L. B. Huff and E. M. Gross, of Greensburg, Pa., who comprised the Wayne Coal Company. The consideration was about $100,000.

The mine is a drift mine, and consists of an upper vein of Pittsburg coal 4½ feet thick and a lower vein six feet. The upper vein is being developed, the daily output being 250 tons. Roy Wise, manager of the Western Coal & Coke Company, has plans prepared for extensive improvements that will double the capacity of the mine.

The J. Wood & Brothers Company has increased the wages of employes in its iron mills at Conshohocken, Pa., 10 per cent.

The record for loading ore at the Ashtabula, O., harbor was broken a few days ago when 612 cars were loaded. Heretofore the record was 606 cars.

A new pattern shop will be erected by the Keystone Agricultural Works in Pottstown, Pa.

Seven Principal Routes.

It is a well known fact that the C. M. & St. P. Ry. system offers great many different routes between Chicago and St. Paul and Minneapolis. Its main line between those points is especially well known as the route over which runs the famous "Pioneer Limited" and the Government Fast Mail Train. There are six or seven other routes over a number of which are run through coaches and sleeping cars, which are almost as direct as the principal main line.

These various routes traverse the most interesting and attractive sections of Illinois, Wisconsin, Iowa, and Minnesota, including the celebrated "Lake region" of Wisconsin, and cross the Wisconsin river at the famous "Dells," where is the most picturesque scenery in the Northwest.

The main line and several others include from 150 to 300 miles of romantic and picturesque scenery along the Mississippi river. On these various lines are located the most important towns and cities in the Northwest.

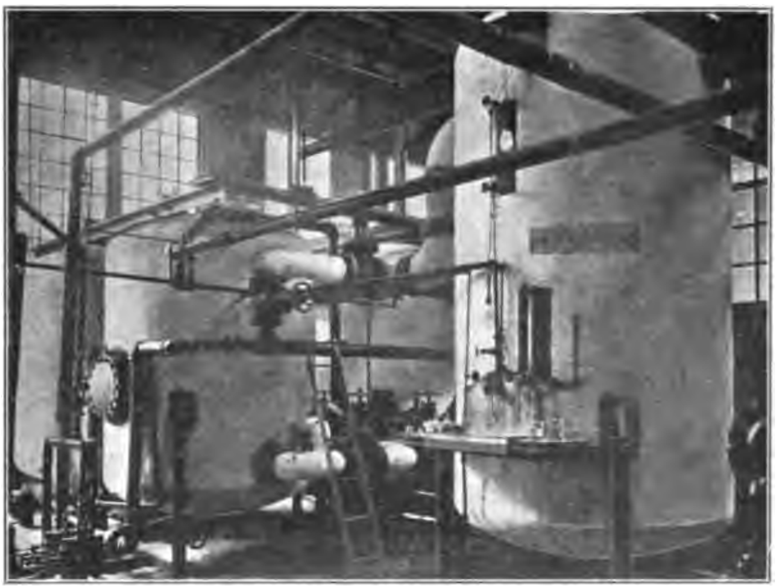
Both one way and special excursion tickets between Chicago, St. Paul and Minneapolis are honored via any one of these direct lines.

The teachers attending the National Educational Convention at Minneapolis will appreciate and take advantage of this fact as they can have a choice of routes going and returning.

WATER TREATING SYSTEMS.

BY J. C. WILLIAM GRETH, M. E.

THROUGHOUT the manufacturing world where steam boilers are used we find little territory in which we can find water free from scale-producing and corroding substances, viz,—lime, magnesia, sulphur, silica, iron, sulphuric and carbonic acid in solution, and sand and vegetable impurities in suspension, which, if forced into boilers form a hard scale. The heat used to generate steam sets free the various substances held in solution and suspension. These are precipitated on the inner shell and tubes of the boiler. The constant, intense heat to which these surfaces are exposed transforms these substances into hard scale, which is a non-conductor of heat. In the modern boiler the surfaces on which this incrustation forms is not easy of access for cleaning. As the scale increases in thickness so also does the fuel bill increase, only at an increased rate. In many cases 50 per cent is added to the cost of fuel. Scaled boilers require frequent repairs and many cases are the direct cause of disastrous explosions. In the Pittsburg district, the manufacturing center of the country, where the sources of water supply are contaminated



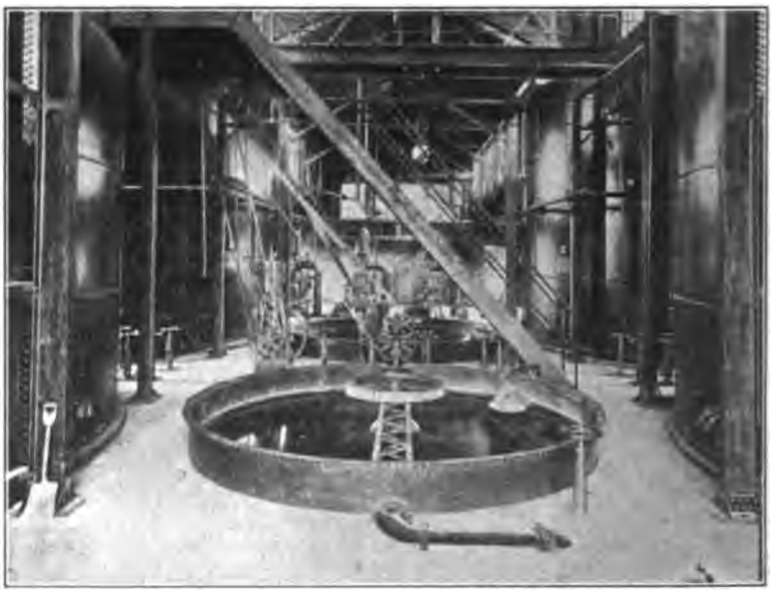
Water Purifying Plant Pencoyd Iron Works, Philadelphia, 6.000 H. P., installed by Wm. B. Scaife & Sons Co.

with every form of scale-forming substances and corroding acids due to the large manufacturing establishments and mines whose refuse is emptied into the Monongahela, the Allegheny and Ohio rivers, the acids and oxides from the coal mines and factories pollute the rivers to such an extent that the lives of the boilers are only one-tenth of what they would be if pure water were fed into them.

Steam users are beginning to take an active interest in procuring some method of purifying their boiler feed water before it reaches the boilers. The days of boiler compounds, whether they are acids, alkalies, organic or mineral, fluids or powder are past. The best engineers of the country have long ago given them up as inefficient and in many instances positively dangerous. A boiler is not a chemical retort, and is not designed or intended to be used as one. Boiler compounds precipitate the scale forming substances, that is, provided they are efficient. These lay on the bottom of the boilers, covering it with a thick coat of mud and sludge in many instances cause the fire sheets to become burned, and so reduce the tensile strength of

the metal. Sometimes this mud and sludge remains in suspension, which with the impurities still remaining in solution are very apt to cause priming and foaming, the danger of which is too well known to need further discussion here.

The use of crude or kerosene oil is extremely dangerous and is condemned in most forceful terms by every engineer of note who has studied the matter at all. The insurance companies positively prohibit its use. The manner in which carbon oil acts is as follows: It being an hydrocarbon it permeates the scale and gets between it and the boiler iron. The scale thus loses its purchase on the iron and the boiler in cooling contracts, the scale coming off in patches. If this scale is examined it will be found to be black on the side next to the iron. This coating is iron taken from the boiler shell. Another bad effect of the use of oil, either crude or refined, is that owing to the high temperature of the steam in modern boilers the oil is decomposed and a gas of high oxidizing power is formed which will explain the leaky steam joints all along the lines as well as leaks in the boiler itself. It is dangerous for the following reason, aside from its effect on the boiler, that on emptying a boiler the oil remaining in the shell goes off as gas, due to the high heat of the brick work and shell, which with the air in the boiler forms a gas similar to fire damp, and more than



Water Purifying Plant, Lorain Steel Co., Lorain O., installed by Wm. B. Scaife & Sons Co.

one man has been severely burned by putting a lighted torch in the manhole of a boiler in which oil has been used. The use of oils of this kind cannot be too severly condemned and censured.

An exhaust steam feed water heater is valuable for the purpose of removing some of the scale forming substances, viz: the carbonates of lime and magnesia; this they do to about 45 per cent in the most efficient heaters by driving off the carbonic acid gas which holds them in solution as bi-carbonates. No feed water heater, however, will touch the sulphates or acids. So we must find other means of providing pure water. Some heater manufacturers are introducing chemicals into their heater; this has been proven by actual test to reflect on the heater and has in a good many cases hurt the reputation of what might have been a first class feed water heater by its being condemned as a heater, chemical purifying system and filter combined in one. Theoretically it is a perfect machine, but in practice it fails for several reasons—improper supply of chemicals; the chemicals not being thoroughly mixed with the water; and improper and insufficient filtration to remove the precipitates and suspended

matter. The live steam purifier is more efficient than the exhaust steam heater, as it precipitates the scale forming substances by raising the temperature to a point where they become insoluble, but the trouble with this apparatus is that while the substances are precipitated they are carried into the boiler and there form scale. The devices employed to catch this scale are not sufficient or efficient in catching the precipitated matter and nearly as much scale is formed in the boiler as without its use, and it has no effect whatever on the free acids; besides this, it is a very expensive apparatus to operate owing to its use of live steam, which is a direct source of loss.

One of the best methods of water purification that has been put on the market up to the present time is the following, and its successful performance on the Monongahela river water has led the makers to go into the manufacture of these systems on a large scale: The water after first being heated to from 180 to 210 degrees in an exhaust steam feed water heater, whether of the open or closed type, is passed into an especially constructed tank into which the chemicals are introduced; here the chemical action takes place, assisted in two ways, viz:—the water being hot and under pressure, thorough mixing of the chemicals with the water is easily attained in the moving water. Some of the precipitate and suspended matter can be blown out at the bottom of this tank through a valve provided for that purpose; the precipitate and suspended matter held in suspension is removed by thorough filtration through a pair of filters especially designed for this purpose. The filters are so arranged and piped that one may be washed while the other is working, thus avoiding any shut-down, the water going to the boilers, pure and clear, freed from all scale forming substances, as well as any corroding acids. The determination of the kind and quantities of chemicals to be used can only be made by the analysis of the water, checked by actual test. Hit or miss methods will not do, for if too much chemical is added it goes into the boiler and may do damage; but this quantity can so easily be determined by simple test which any man with ordinary intelligence can make, and the correct quantities added even for a variable water supply. The chemicals are introduced by means of the two pumps shown in the cut, which force the solution from the solution tanks into the precipitating tank, there to act on the substances which it is desired to remove from the water. The attention this plant requires is simply that of routine; filling the solution tanks twice in 24 hours with known quantities of chemicals which can be bought in open market at not over $1.25 per 100 pounds, and washing out the filters once in 24 hours. This, however, depends on conditions, and in some extreme cases has to be done every 12 hours. The cost of treating ordinary water is from ½ cent to 5 cents per 1,000 gallons, so it is at once apparent that such a plant is a money saver, both by its saving in fuel and labor of cleaning boilers, aside from the saving in repairs on the boilers in addition to lengthening their life.

Another system which has been on the market for sometime is known as the We-Fu-Go system. This method permits more accurate and uniform treatment and is easy to handle. This system consists of two, or more settling tanks which hold a given quantity of water, and to each tank of water is added the necessary quantity of chemicals. The water is then thoroughly mixed by a mechanical stirring device; this consists of two-armed paddles placed at the bottom of the tank fastened to a vertical shaft which is operated by gearing driven by a small steam engine. These paddles make about six revolutions per minute. This thoroughly mixes the chemicals with the water and the stirring of the water always hastens the chemical reaction. These settling tanks act also as subsiding basins as soon as the stirring device is stopped and the circulation of the water ceases. Filters of either the gravity or pressure type are used for the final clarification. This system can be used to good advantage in a large plant where the water is to be treated before it goes to the heaters. This system treats the water cold and the results obtained are equal to those described in the above system. The cut shows the operating floor of one of the 12,000 H. P. plants installed at the Lorain Steel Company, Lorain, O.

The above described systems must strike any practical engineer, chemist or manufacturer as a simple and thoroughly scientific method of treating boiler feed

water. The cost of operation is a trifle, and the first cost is soon made up by the decreased amount of fuel consumed for a given quantity of steam to be generated. It is only too apparent that a scaled boiler will require more fuel than one that is clean as it takes more heat to go through scale and iron than iron alone. It is also evident that owing to the heating of scale on the shell and tubes that they must necessarily be of a higher temperature, hence they are subject to a much more severe use than is necessary, and to increased repair bills and greater exposure to disastrous explosions. Pure water means clean boilers, clean boilers is synonymous with maximum boiler efficiency, which means a saving in fuel and wear and tear on the boilers, increased protection against repairs and explosions.

This system is in use by some of the largest steam users in the country, who cannot say enough for the results they obtain from its use. This system is manufactured by the William B. Scaife & Sons Company, of this city, who are prepared to furnish them for any size plant, absolutely guaranteeing the results.

NOTES FOR THE CHEMIST.

Phosphorus in Iron—K. Ramorine (Abstract in Jour. Soc. Chem. Ind. from Stahl and Eisen, 22-386) 0.25-0.50 grams of sample is dissolved in 40 c. c. of nitric acid of sp. gr. 1.20, then diluted to 50 c. c., silica and graphite removed, the filtrate oxidized with permanganate (10 grams per liter), and the manganese peroxide reduced with sugar. Heat until clear, neutralize with ammonia, add 50 c. c. of molybdate solution and heat to 80 degrees. Shake five minutes, collect precipitate on paper, wash three times with 1.0 per cent nitric acid and 0.1 per cent potassium nitrate solution. Return to original flask, dissolve precipitate in 10 c. c. of 0.77 per cent soda solution, and titrate with normal (two per cent) nitric acid. The soda is standardized by dissolving 0.062 gram of phosphomolybdate dried at 100 degrees (=0.001 gram of P). In 100 c. c. of the solution, adding phenol-phthalein and titrating with N nitric acid. An analysis of cast iron only occupies 20 to 30 minutes. (The methods for precipitating the phosphorus and standardizing the soda solution are different from those generally used in this country).

Volumetric Determination of Copper—F. Repiton (Monit. Scient., 1902, 16,287.) The author recommends the use of potassium ferro cyanide, instead of potassium cyanide. A N-10 solution is added from a burette to a boiling neutral solution of the copper as sulphate, until test drops on a porcelain plate show a blue coloration with ferrous sulphate. The application of this method to other metals is being investigated. Exact results are also obtained if a neutral solution of the copper as sulphate, chloride, or acetate is precipitated with an excess of standard oxalic acid solution. Set aside for three hours, then add a little sulphuric acid and titrate excess of oxalic acid with permanganate solution of known relative value, the amount of oxalic acid combined with the copper being calculated by difference. The value of this, in terms of copper, is decided by repeating the process on a copper solution of known strength.

Reagent for Pure Water—H. Causse. (Chem. Centr., 1902-778). The author proposes Crystal Violet or p-hexamethyltriaminotriphenylcarbinol as a reagent for the detection of contaminated water. If a solution of Crystal Violet made colorless with sulphuric acid be added to a pure water, the original color reappears, the intensity of the reaction being greater if water which has been warmed to 35-40 degrees C. and afterwards cooled, be used. If the water be contaminted with animal refuse, the color is not regenerated. The reagent is prepared by dissolving 0.25 gram of Crystal Violet in 250 c. c. of pure water saturated with sulphur dioxide. For the test 100, c. c. of water are treated in a stoppered bottle with one and one half c. c. of the reagent. Pure water is gradually colored violet from above downwards. After warming and again cooling before the test, the reaction is about 10 times more intense.

Methods of Analysis for Cast Iron—H. Bollinckx, Brussels, Belgium. (Iron Trade Review, May 22.) The author gives methods for the determination of graphite, combined and total carbon, silicon, manganese, phosphorus and sulphur. They are modifications of the methods generally used in the United States and if typical of the methods used in Belgium, they should be interesting to chemists here.

THE EQUILIBRIUM OF IRON-CARBON SYSTEMS.

BY G. CHARPY AND L. GRENET. Bulletin de la Societe d' Eucouragement.

BAKHUIS ROOZEBOOM in 1900 gave an interpretation of the facts known with regard to the constitution of metals formed of iron and carbon, which is irreproachable from a theoretical point of view, ab ut some points of which are doubtful in consequence of the insufficiency of actual exact experiment. In particular, the conditions under which Mr. Roozeboom holds that the carbon separates in the form of graphite in white iron submitted to re-heating are evidently in contradiction with a certain number of facts previously observed in the manufacture of malleable castings. Messrs. Chatelier and Stansfield have objected to this point of view, and quoted the experiments of Royston, Mannesman, etc., according to which the separation of graphite would follow a course distinctly different to that which has been adopted by Mr. Roozeboom. In these experiments, carried out from a practical point of view, substances other than carbon contained in the castings have not been taken into account, although certain of these substances, such as silicon, manganese, etc., possess an incontestible influence over the separation of graphite. It can be believed, as Hugh P. Tiemann points out in a work recently published, that the abundant separation of graphite, observed by N. Royston, is due to the presence of silicon in the irons used.

We have studied a great number of examples from this point of view, and give in particular the results obtained from five samples containing practically the same amount of total carbon, in which the other elements were in small quantities, except silicon, which existed in variable amounts.

The following table shows the composition of these irons:

	Carbon.	Silicon.	Manganese.	Sulphur.	Phosphorus.
No. 1	3.60	0.07	0.03	0.01	traces
No. 2	3.40	0.27	traces	0.02	0.02
No. 3	3.25	0.80	traces	0.02	0.03
No. 4	3.20	1.25	0.12	0.01	0.01
No. 5.	3.30	2.10	0.12	0.02	0.01

These metals have been cooled in cold water, and do not contain appreciable quantities of graphite, except the last, which contains 0 20 per cent.

Parts of these irons were submitted to more or less prolonged re-heatings at different temperatures. These temperatures were obtained by heating up and then cooling after a high enough temperature had been reached; in each case the operation was ended by quenching in cold water. In the samples thus treated the total carbon and the graphitic carbon are determined, the difference giving the combined carbon.

The graphite was estimated, following Ledebur's process, by dissolving the metal in 1.18 nitric acid, and burning the residue remaining insoluble after an hour's evolution in oxygen. It is, perhaps, well for us to specify that what is called graphite in this paper, although it is usual in metallurgical research, is the residual carbon insoluble in nitric acid. The amount of silicon was also determined in each sample. From these results we can deduct the following conclusions relating to the separation of graphite carbon by re-heating. We give in each example the observed amount for graphite and combined carbon, though the sum is not exactly constant for each sample. It is necessary then to reckon the value of these two amounts in order to eliminate the influence of variations of carbon due to a partial decarburization during re-heating, or to irregularities in composition of an ingot, which we have not thought necessary to correct.

1. Graphite separated at low temperature when the silicon is high.—Thus, with sample No. 1, which contains only traces of silicon, a prolonged heating at 1,100 degrees or lower does not give place to any separation of graphite. But at 1,150 degrees the separation takes place.

In No. 2, after heating for four hours at 700 degrees, 800 degrees, 900 degrees, and 1,000 degrees, not a trace of graphite is to be seen. But it appears after heating to 1,100 degrees.

In sample No. 3 traces appeared after heating to 800 degrees.

In samples Nos. 4 and 5 it was sufficient to heat to only 650 degrees to separate the carbon. In the latter, particularly after heating for six hours at 650 degrees, the percentage of graphite rose from 0.10 per cent to 2.83 per cent.

2. Separation of graphite, once begun, continues at temperatures below that which repel the reaction.—Thus a piece of No. 1 steel heated to 1,170 degrees, and quenched contained only 0.50 per cent graphite and 2.61 per cent combined carbon. Another piece of the same metal heated in the same time to 1,170 degrees, and cooled slowly to 700 degrees, and then quenched, contained 1.87 per cent graphite in 0.43 per cent combined carbon. Similarly, a piece of No. 3 iron heated to 1,170 degrees, and quenched, contained 1.42 per cent graphite and 1.69 per cent combined carbon. Another piece heated to 1,170 degrees and cooled slowly to 700 degrees, and then quenched, contained 2.56 per cent graphite and 0.38 per cent combined carbon.

3. At constant temperature separation of graphite is effected progressively more feebly as the temperature is lower and the amount of silicon is less—

No. 3 iron with 0.80 per cent silicon, we get:

One hour	800	0.10	3.19
Four hours	800	0.22	3.07
One hour	900	0.30	2.97
Two hours	900	0.60	2.40
Four hours	900	1.58	1.14
One hour	1,000	0.37	2.94
Two hours	1,000	1.50	1.41
Four hours	1,000	1.47	1.29

No. 4 Iron, 1.20 per cent Silicon.

One hour	700	0.06	3.42
Two hours	700	0.11	3.30
Four hours	700	0.20	3.13
One hour	800	0.12	3.08
Two hours	800	0.51	2.47
Four hours	800	1.64	1.56
One hour	900	2.28	0.90
Two hours	900	2.32	0.90
Four hours	900	3.35	0.99

No. 5 Iron, 2 per cent Silicon.

One hour	700	1.39	1.90
Two hours	700	2.09	1.19
Four hours	700	2.67	0.28
One hour	800	2.36	0.78
Two hours	800	2.31	0.89
Four hours	800	2.43	0.54
One hour	900	2.33	0.88
Two hours	900	2.32	0.90
Four hours	900	2.33	0.90

It is seen that in this case the equilibrium is obtained at the end of one hour at 900 degrees, since the amount of graphite does not vary when the heating is continued for four hours. In No. 3 iron, with 0.80 per cent silicon, it is far from being attained after four hours' heating at the same temperature. In the irons poorest in silicon, the phenomenon is not seen, because the transformation does not occur at temperatures less than 1,100 degrees in spite of prolonged heating.

4. The amount of combined carbon which corresponds to the equilibrium at a given temperature diminishes when the amount of silicon increases.—The following table shows the figures taken after four hour's heating at different temperatures. For the samples Nos. 1 and 2 the reaction took place at first on heating to 1.150 and 1,100 and cooling slowly to the proper temperature:

	To 1100 deg.		To 1000 Deg.		To 900 Deg.		To 700 Deg.	
Samples	Graphite	Combined Carbon	Graphite	Combined Carbon	Graphite	Combined Carbon	Graphite	Combined Carbon
No. 1	1.15	1.74	1.03	1.74			1.87	0.43
No. 2	1.26	1.93	1.00	1.62				
No. 3	1.61	1.26	1.60	1.52	1.67	1.17	2.56	0.38
No. 4	2.10	1.02	2.20	0.98	2.32	0.90		
No. 5	2.18	1.00	2.10	0.93	2.33	0.90	2.67	0.28

5. The amount of combined carbon which corresponds to the equilibrium diminishes as the temperature decreases.—The figures given above already indicate this diminution. We give, however, the results obtained in two series of experiments, in which we have tried to approach, so far as possible, the state of equilibrium. For this purpose, samples of 1 and 3 irons, surrounded by pulverized wood carbon, have been heatedto 1170 degrees, and cooled very slowly; about 50 degrees per hour from different temperatures; maintaining these temperatures for two hours and then quenching. For temperatures below 900 degrees, operations lasting more than a day have been done several times; that is to say, when we get to 900 degrees, it is allowed to cool, and the following day re-heated to 900 degrees, and is given slow cooling. The following resluts are thus obtained:

Temperatures. deg.	Sample No. 1. Graphite	Combined Carbon	Sample No. 3. Graphite	Combined Carbon.
1170	0.50	2.61	1.42	1.69
1100	1.15	1.74	1.49	1.48
1000	1.03	1.74	1.35	1.55
900			1.91	0.99
800	1.15	1.31	2.09	0.43
700	1.87	0.43	2.56	0.38

The microscopic examination of the different samples treated confirms the results of chemical analysis, without adding much information. In the primitive state the samples all present the aspect known as white irons. When irons low in silicon are reheated to different temperatures, the respective dimensions of these elements are modified; and the concentration of the martensite varies according to laws already known; in the silicious irons the graphite is easily visible by sample polishing without chemical attack. The nature of the separated graphite varies with the temperature of separation and with the amount of silicon.

When we examine certain samples in which we try to get the equilibrium at the lower temperatures, we notice that the transformation is more advanced in certain regions where the graphite is found in direct contact with the ferrite.

It is natural enough to admit that these are the regions where transformation is complete: consequently, the stable state in the cold of iron carbon systems corresponds to the co-existence of the two phases, pure iron and graphite; all the other forms obtained in iron and steel, notably cementite, would be unstable at the lower temperature. The case of iron-carbon systems would be to approach that of phosphorus, for which the stable form in the cold is red phosphorus, but what is obtained and used most often is the unstable form of white phosphorus.

We have also determined the practical points of the irons studied by the pyrometric method. For these different samples we have always observed two very distinct critical points, practically at the same temperatures. The first, which is produced about 700 degrees, corresponds to the resolution of the pearlite. It is too well known to be explained here. The second is observed at about 1150 degrees: it is extremely distinct, and shows the heating and cooling of an iron poor in silicon. It is produced in the same conditions with silicious and non-silicious irons.

The following table shows the temperatures at which this second critical point has been observed for the different samples:

Sample.	Heating	Cooling.
No. 1	1140	1120
No. 2	1165	1145
No. 3	1137	1130
No. 4	1165	1137
No 5.	1165	1145

It has not been possible for us to determine if this critical point corresponds to the resolution of the martensite-graphite eutectic mixture, or to that of the martensite-cementite eutectic mixture. Perhaps it may combine the two transformations, which idea would much more approach the indication of Roozeboom's diagram. A very interesting peculiarity is that this critical point of 1150 degrees is, in all the samples, much more emphasized in the heating than in the cooling. It is the inverse of what is ordinarily observed with critical points.

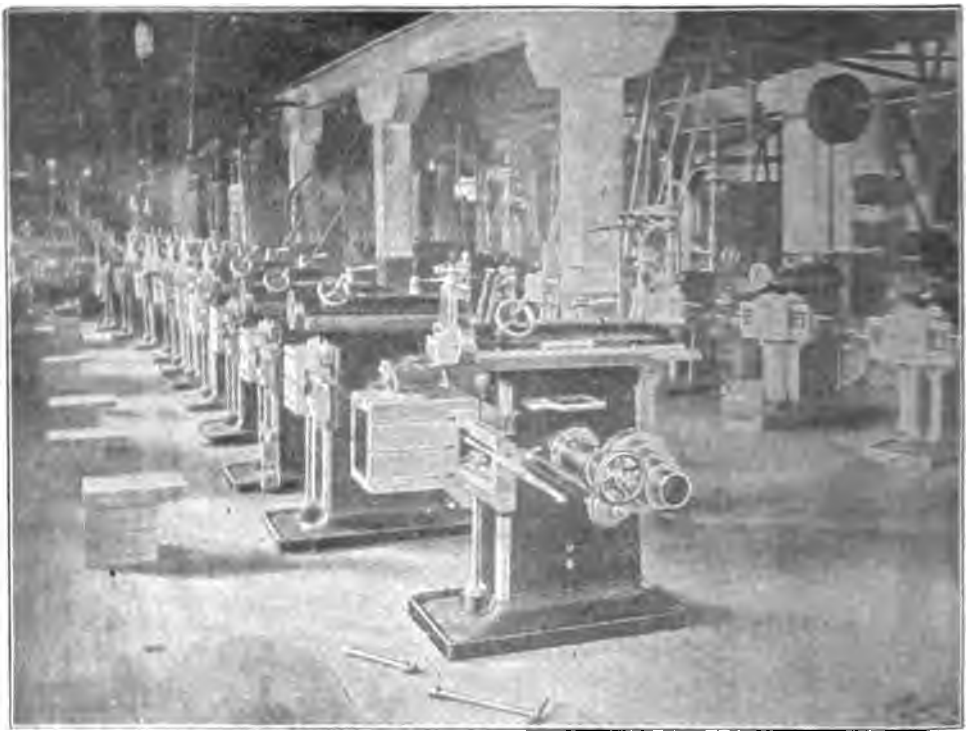
The observations contained in this note already indicate that a certain number of points in Roozeboom's diagram require modification; but it seems necessary to have the experiences of others before suggesting a new chart.

Late Designs in Shapers.

A RECENT disastrous fire in a Cincinnati foundry resulted in the complete destruction of all patterns covering the line of shapers manufactured by the American Tool Works Company, of that city. Profiting by an extensive experience in the requirements of the trade, the firm took this opportunity to effect a number of radical changes in the sizes as well as the detailed designs of the machines, comprising the new line and, as a result, their new shaper, as it stands today, is in every way a superior tool.

The former line of shapers embraced the 15, 17, and 21 inch crank, 16 inch back geared, 26 and 28 inch triple geared: the new shahpers will appear as the 16 inch plain crank, 16, 18, 21 and 25-inch back geared crank and 26 and 30 inch triple geared.

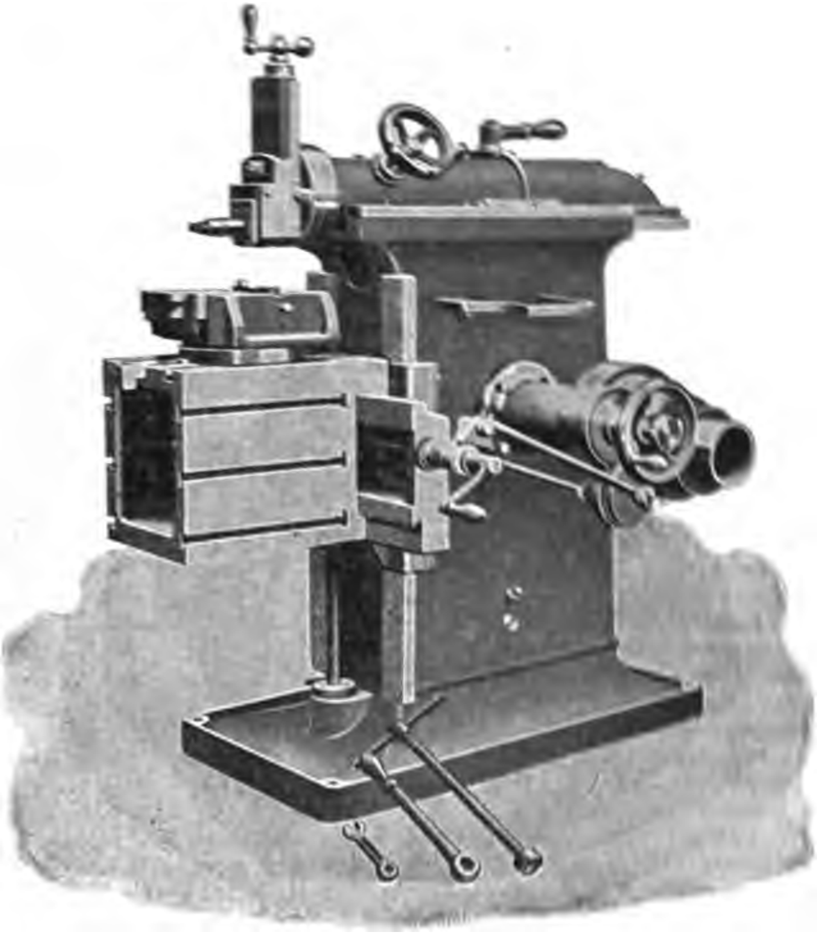
The first of these to be brought to completion are the 16 inch plain crank and the 16 inch back geared crank shapers. We illustrate in the accompanying engravings a view of that portion of the works devoted exclusively to the construction of



First lot of Improved 16-inch Plain Crank Shapers, made by The American Tool Works Company.

shapers, with the first lot of twenty-four 16 inch plain crank shapers nearing completion, and a faithful reproduction of the completed machine. This shaper is heavier and stronger in every way than its predecessor. The column, base, ram, table, and so on have all been made of greater dimensions and weight thus giving additional power and capacity to the machine, yet retaining its graceful, well proportioned, compact appearance. The stroke is positive and has five rates of speed. Its length may be changed at will without stopping the machine, and the index shown in the cut facilitates the setting of the stroke to the length desired. The rocker arm is pivoted near the base line, and this gives the ram an almost uniform rate of speed its entire stroke and provides an exceedingly quick return. Rocker arm is of double section permitting two and one-half inch shaft to be passed under the ram through

the hole shown in the top of column, for key-seating. This machine operates with convenience, ease and smoothness, is susceptible of fine and positive adjustments while in full operation, rendering it especially adaptable to tool room work.



16-inch Plain Crank Shaper made by American Tool Works Co.

Volumetric Determination of Iron--W. H. Gintl, (Chem. Trade Jour. May 17. Abstract from Ziet. Angw. Chem.) The author critises the various methods that have been proposed. Reduction with zinc and subsequent titration with permanganate gives unreliable results on account of the impurities introduced with the zinc. Reduction with metallic copper and sulphuric acid gives more concordant results, but they are always high, because some cuprous sulphate is formed, which is not decomposed again. The author has used palladium wire impregnated with hydrogen gas. By this means very satisfactory results were achieved, whether the quantity of iron present was large or small. The solution is heated with the palladium and a little sulphuric acid on the water bath for one and a half hour's and then titrated with permanganate. The palladium may be charged either by heating and allowing it to cool in a current of hydrogen or by making it the cathode of an electrolytic cell.

NEW SYSTEM OF COOLING BLAST FURNACE TUYERES.

BY HORACE ALLEN, Paper read before the Iron and Steel Institute, London, Eng.

WITH the process of smelting iron in blast furnaces has, unfortunately, always been associated the difficulty of protecting efficiently and economically the end of the air-blast pipes from being damaged by the high temperature in their immediate proximity, due to the rapid combustion of the fuel. The higher the pressure of the blast, the more intense is the combustion. This difficulty was increased by the introduction of the air-blast at higher pressures than were used in the earlier days of iron-smelting, and further by the raising of the temperature of the ingoing air up to the degrees of heat now attainable by the employment of fire-brick hot-blast stoves of Cowper, and others of similar character. For many reasons water has been found to be the most efficient and convenient agent for preserving the end of the blast pipe from injury through heat influences; the water being introduced through a protecting nozzle, or tuyere, in such a way, and in such a quantity, as to keep the end of the blast-pipe below the degree of temperature that would otherwise damage it.

Though, no doubt, considerable study has been expended on the question of the best form of tuyere to be adopted, so far only a few varieties are found in common use, the general principle of their construction being a hollow cylindrical nozzle, or tuyere, through which water is passed in sufficient volume to reduce the temperature in the immediate proximity of the blast pipe below the softening point of cast iron.

Thermal loss due to cooling water.—At this stage it is well to remember that the application of water to cool the end of the blast-pipe is a source of thermal loss, for as the water flows through the tuyere and becomes heated, the equivalent amount of heat is extracted from that derived from the combustion of the fuel; and as this gain of heat of the water is not turned to any useful account, it becomes a loss factor in the economy of the blast-furnace. In this connection it may be pointed out that the adoption of the system of water-cooling plates, etc, so largely applied to the modern blast furnace, while it helps to keep the lines of the furnace very nearly normal, is also accompanied by a direct loss of heat efficiency. This point is worthy of more careful study in regard to the latest designs of furnaces.

Remarks on common practice of cooling tuyeres—In the application of water for tuyere-cooling purposes, it has been found from experience that the volume required is considerable, and to provide this volume, as a constant supply, has necessitated a system of storage with a certain head, or pressure. The pressure above that of the atmosphere at which the tuyere water is usually supplied varies in different localities from 10 pounds per square inch to 30 pounds per square inch. This pressure leads to a further complication, for, though it is useful in insuring the delivery of the required quantity of water to the tuyeres, it is found that should any damage happen to cause a puncture in the tuyere, the high pressure of the water supply causes the water to escape into the furnace, and come in contaact with the highly heated materials in proximity to the tuyere.

To refer back somewhat for the sake of preserving the interior lines of the furnace as far as possible, it is usual to cause the tuyeres to project a few inches past the hearth wall into the interior, where they are in direct contact with the highly heated iron and slag as they descend into the hearth, to say nothing of the eroding action of the coke, etc., in their neighborhood.

Pressure of air-blast in the interior of the blast-furnace—In furnaces which the author has examined, with a blast pressure at the engine of four and one-half pounds the pressure at the tuyere testing hole was about three pounds, while inside the furnace the pressure was only about one and one-half pounds, and with the higher pressures now adopted there will probably still be a reduction of about one and one-half pounds between the pressure at the blast pipe and inside the furnace crucible.

Probably no English furnace has, up to the present, a higher pressure of blast at the blast pipe than nine pounds, and this would be reduced at least one and one-half pounds, leaving seven and one half pounds, which is equal to a head of water to 17 feet; so that if the tuyere water supply exceeds a pressure of seven and one-half pounds per square inch. any defective tuyere will allow of water passing into the furnace crucible. even when the blast is full on.

The effects upon the furnace working of water leaking into the crucible are well known.

While all reference to the leakage of water into the furnace hearth applies equally to both tuyeres and coolers, the latter are, however, seldom found to leak, so the new system under consideration will only be described as applied to the tuyeres.

Description of new system of cooling tuyeres.—In the new system, invented by W. J. Foster, of cooling blast-furnace tuyeres in such a manner as to prevent the leakage of water into the furnace crucible, the water is not applied under pressure, but is aspired through the tuyeres by suction. It will be evident in this case that, should any tuyere become damaged through the intense heat, erosion, faulty coil pipes, or impure or hard water, no water can escape into the furnace. Very little alteration to the usual pipe fitting is required to enable the new system to be applied to any furnace, the chief desideratum being a reliable pump, preferably of sufficient size to permit of a low piston speed of about 100 feet per minute, and capable of continuous running. Where a sufficient fall is available the addition of a syphon pipe will greatly reduce the wear and tear in the pump, as well as relieve the furnace from being dependent upon the pump. The pump is then only necessary for starting the syphon and restoring the vacuum when necessary.

With this system, when a tuyere happens to become damaged and leaks, instead of water entering the furnace. air tends to enter the tuyere and destroy the vacuum, and solid particles, molten iron and slag, usually close up the hole almost immediately, though a hole one-fourth inch or three-eighth inch in diameter will not cause the water to stop flowing entirely. By means of three sluice valves arranged near the pump the syphon may be put into action, and the pump cut out by stopping it, opening the by-pass, and closing the inlet and delivery of the pump. With this arrangement of pump and syphon, two or three furnaces can be successfully worked, as the water supply would not be dependent upon the continuous action of the pump, which any slight packing or repair might render necessary to stop for a short time.

To allow a sufficient volume of water to pass through the tuyere coil under the reduced pressure, the diameter of the pipe employed should be increased from one inch to one and one-fourth inch, in which case a moderate vacuum will readily pass 1,200 gallons of water per hour through each tuyere, with an increase of temperature under normal conditions of about 15 degrees to 16 degrees Fahr. The piping employed for the tuyere coils should be of best quality, as any film of air enclosed in blisters prevents the water from acting on the outer surface at that point, so permitting the pipe to burn.

Under the pressure system the number of tuyeres lost varies very considerably owing to many causes, being sometimes as low as 36 tuyeres per furnace per annum, on a furnace with eight tuyeres, and at other times the loss suddenly rushes up to 12 tuyeres per week. An important advantage of the vacuum system over the pressure system is that a tuyere is much more readily changed, owing to its being free from air accumulation of material on the end projecting into the furnace through water leakage; the tuyere can awlays be changed in a good fire in five minutes. In one instance a tuyere was changed in four and a half minutes.

Method of indicating defective tuyeres.—When the cooling water is supplied to tuyeres under a considerable head, it is no easy matter to detect a leaky tuyere, unless the leak is of considerable proportions; the result being that a tuyere may sweat, or slightly leak, for a considerable period before it is discovered. With the suction method of drawing the water through the tuyere, besides the impossibility of water entering the furnace through a leak, the effect of a leak in the tuyere coil is to reduce or destroy the vacuum; but by means of an automatic guage, fitted with electric-

al attachments, it is possible to indicate at any convenient point that a leak has occurred, as well as to show which tuyere it is that has become defective. The indicator invented by B. H. Thwaite consists of a tube containing mercury so placed that when the vacuum in the pipe leading from the tuyere is reduced, the mercury in the gauge tube makes contact and closes an electric circuit, ringing an alarm bell, and indicating, by a number on a register, the particular tuyere that requires attention.

To give an instance of the difference between the two systems: a tuyere working under the usual conditions of water cooling under pressure was found to be leaking. Instead of changing the tuyere, the pipes were connected so that the cooling water was drawn through by suction, with the result that the tuyere worked satisfactorily for six days. The tuyere was then taken out for examination and it was found that the original hole through which water had been leaking, when under pressure, had become covered with slag and graphite, thus prolonging the life of the tuyere very considerably when working on the new system. Although when under pressure this tuyere had permitted a lot of water to enter into the furnace, causing the quality of the iron to fall to "forge," ordinary examination failed to detect the leakage.

COKING AND BY-PRODUCTS.

AT the recent annual meeting of the British Iron and Steel Institute, J. H. Darby, of Brymbo, read a paper on "Compression of Fuel Before Coking" and J. Thiry, of London presented a paper on "The Recovery of By-Products In Coking."

Mr. Darby referred to the growing scarcity of the best coking coals and to the various devices employed for the utilization of inferior seams. The results of compression of coal before coking, which was the subject of his paper, showed that the advantages were by no means confined to the porous coking fuel. The idea of compression originated on the continent. It had been observed that the coke produced from the lowest portions of retort ovens was superior to that produced from the pure portions of the charge. This led to experiments in compressing fuel. At first it was stamped in the oven by hand, in other cases the charge was weighted. This led to compression in a box outside the ovens, the stamped coke being afterwards moved out of the box into the oven by mechanical means. The degree to which the slack might be compressed varied with its character, state of division, content of moisture, and other conditions. Generally speaking, it was found that the weight of a given bulk of compressed fuel in an oven was 50 per cent greater than fuel charged in the ordinary way. Side clearance had, however, to be allowed, and this reduced the advantage from 25 to 30 per cent. The compressed fuel, however, coked more slowly than the uncompressed, and the net gain therefore amounted to between 10 and 12 per cent. To find the difference in in the character of the coke, the weight of a cubic foot from a solid lump of coke was estimated. Of three samples from Durham the weight per cubic foot for uncompressed coke was 63.37 pound, and for compressed coke 80.88 pound. In North Wales uncompressed coke average weight was 56 pound per cubic foot, compressed coke was 60.57 pound. From South Yorkshire coal uncompressed coke was 53.9 pound, and the compressed coke 57.9 pound. The West Lancashire coal gave uncompressed coke 50 pounds, and compressed coke 56.4 pounds. It would be seen, therefore, that the compressed coke was considerably denser. In addition to this there were other advantages. The breeze, or small coke, was very much reduced in quantity; the lumps of coke were larger and firmer, and in a marked degree bore handling without very much breakage. The process of charging an oven by the mechanical means in use when compression of fuel was adopted occupied much less time than the old method of charging by hand; in fact, the time was reduced from 10 or 12 minutes to three or four minutes. Smoke was therefore largely pre-

vented, and the loss of by-products was less. In some cases the yield of ammonia had been increased 25 per cent. Less hand labor was employed, and the laborious work of forcing the wet fuel out of the tubes into the ovens, and levelling the charge in the ovens, was entirely abolished; while the clearance between the cake of fuel and the side of the ovens allowed for free escape of gases, and tended to prevent undue deterioration of the walls. The apparatus by which the compression is carried out was next described, and illustrated by means of diagrams.

The paper by Mr. Thiry referred to the recovery of by-products. He mentioned the prejudice which, he said, still existed in the minds of many against the use of retort oven coke in the blast furnace. About 2,000 ordinary retort ovens and about 4,100 by-product ovens have been established in this country. Dr. C. Otto & Company have confined their practice chiefly to Germany, where no less than 14,000 ovens have been constructed on their system, besides which 2,200 have been erected in the United States. A battery of 50 of their ovens has been in successful operation for about four years at the Newport iron works of Sir B. Samuelson & Company, Middlesbrough, and an additional battery of 80 was built last year at the same works. Altogether about 200 examples of the Otto-Hilgenstock by-product oven will be shortly in operation in this country, and the construction of others in South Wales and Yorkshire is about to be proceeded with. The average output of one of these ovens is 31 to 32 tons of metallurgical coke per week, the size of the oven being 33 feet 7 inches long, six feet six inches to six feet eight inches high, and one foot nine inches wide in the middle. With the new oven there is a lower value of waste heat for the generation of steam, but an increased yield in coke and by-products is obtained. The chief improvements consist, first, in the use of Bunsen burners, so that perfect combustion is obtained, a high temperature is reached, and on this the quality of the coke largely depends; the heating gases have only a very short distance to travel, and this is in the upward direction; therefore, little draught is needed. The losses arising from leakage are thus reduced. Other advantages are also claimed, amongst them being that the coking time is shortened. It is claimed that the increased yield in coke is about five per cent more than the crucible yield, a circumstance principally due to the smaller draught. The cost of labor is said to be no higher than for working the beehive ovens, and the repairs are insignificant. A section of the paper was taken up by discussing the probability of a fall in the price of sulphate of ammonia due to increased production. Figures were quoted with a view to refute the apprehension entertained by those who are interested in this question.

METHOD OF PHOSPHORIZING METALS.

BY ERWIN S. SPERRY. (From the Aluminum World.)

THE question of phosphorizing metals is one which has perplexed many a foundryman and the majority of them, while having tried at various times to introduce phosphorus into molten metals, have abandoned the matter in disgust and purchased their alloys in the metal market.

The difficulty which has confronted those who have attempted this operation has been the ready inflammability of phosphorus, which not only renders the situation dangerous but leaves the factor of uncertainty behind it so that, after the phosphorus has all been added, it becomes an open question about the amount of this element which the alloy contains. One foundryman says that he has never been able to get two heats alike, while another states that all of the phosphorus ignites before he is able to introduce it into the metal. Those who have tried this operation do not hesitate to say that it is one of the most unsatisfactory propositions in the alloying of metals.

It is the yellow variety of phosphorus which must be used, as the red kind is too expensive to permit of its employment, and those who are familiar with the former are fully aware of the necessity of keeping it under water. If left in the open air for a short time it is spontaneously ignited; when kept in the water until one wishes to use it. the sticks must be dried before being inserted in the molten metal; a very difficult operation.

Under ordinary conditions there is an enormous waste in the introduction of phosphorus; in fact under those just mentioned it is not an exaggeration to say that only about five to six enters the alloy. The handling of phosphorus is always accompanied by much risk. Its burns are particularly dangerous and it cannot be touched by the hands. Then, too, its vapor or fumes will, if inhaled in sufficient quantity for any length of time, produce ulceration of the jaw bone. It may be readily seen, therefore, why the majority have had an adverse experience in the manufacture of phosphorus metals. Some, knowing the difficulties before hand, have not dared to enter into the problem at all.

Most of these difficulties and particularly that of the easy inflammability, may be overcome by an extremely simple operation: i. e., copper plating the sticks of phosphorus. Not plating them by means of electricity, but by their own property of reducing copper from its solutions.

The operation is carried out as follows, viz: Dissolve one pound of blue vitriol (copper sulphate) in one gallon of cold water in a glass or earthenware vessel. It may be dissolved in hot water and then cooled, but care should be taken that the temperature is sufficiently low to obviate the melting of the phosphorus. When dissolved, remove the sticks of phosphorus from the tin can in which they are shipped and place them in the solution. In a short time they will become covered with copper and if left sufficiently long a good thick coating will be obtained. The sticks must be moved about from time to time in order to prevent the portions which come in contact from remaining without being plated.

When left sufficiently long in the solution (about an hour is usually sufficient) the sticks may be removed and dried in sawdust or by absorbent paper. Great care should be used, however. in the removal of the sticks as they are quite brittle, and small portions may break off and thus expose the unplated material. If properly plated with the copper the phosphorus is now quite an ordinary substance and will not ignite spontaneously. Indeed, I have allowed, for the sake of test, a stick of phosphorus so plated to lie in the hot sun of an August midday for several hours without ignition having taken place. It is generally advisable to allow the sticks to remain in the air for half an hour or so after they have been dried, as the complete expulsion of moisture is then assured.

The phosphorus may now be inserted into the metal in any suitable manner, either by means of tongs or a plumbago phosphorizer.

It may be well to add that, even though the danger of spontaneous ignition is, by this method, avoided, there is a loss of phosphorus in a more or less degree, depending upon the personal equation of the manipulator. It is conducive to better results, therefore, to make a rich phosphor alloy (such as phosphor-copper) and determine the amount of phosphorus in it by an assay or other suitable means, and then use this rich alloy for adding the proper amount of phosphorus. Too much phosphorus in alloys is, in reality, worse than too little and unless care is exercised one is as liable to err on one side as the other.

Red phosphorus is made by heating the yellow variety to a temperature of 240 degrees C. in closed vessels when the change takes place. It is in the form of powder and while it does not ignite at ordinary temperatures and need not be kept under water, yet its cost is so much greater than the ordinary variety that it cannot be used.

COMPARATIVE COST OF COMBINATION AND ALL STEEL HIGH-WAY BRIDGES.

BY H. G. TYRELL, C. E., Newton, Mass.

IN connection with the design of a bridge for the Pacific coast the following detailed estimate of the cost of an all-steel bridge, and of a combination steel and wood bridge, was made. The main dimensions were as follows:

Span 190 feet; roadway 24 feet wide; two walks each six feet wide (gross); total width 41 feet; depth of truss, 27 feet to 33 feet.

The load to be provided for was a uniform live load of 100 pounds per square foot covering the floor, the available width of the side-walks being taken as 4½ feet net. The latter was of four-inch wood-block paving on three-inch planking. The floor, in addition to carrying the above live load, had to be capable of carrying a concentrated live load such as a 15-ton roller, or two electric cars on each track.

Live load per foot of bridge. 3,300 pounds; dead load per foot of bridge, 2,345.

The trusses were pin-connected. For the combination design, hard pine was used for the top chords, web posts, portals, lateral struts, floor beams and joists. The remaining ports were of steel. The estimated quantities for this case were:

Eye-bars, 42,180 pounds; cast-iron joint blocks, 19,720 pounds; lateral rod, 5,810 pounds, machine work, 5,940 pounds: shoe-plates, 5,200 pounds; loops, 3,160 pounds; hangers 1,240 pounds; making a total of 83,250 pounds, costing $3,130. Hard pine chords and posts 1,750. M.; hard pine lateral struts, 308 M.: floor planking, 1.974 M.; floor joists 2,224. M.; floor beams, 1,480 M.; making a total of 7,736 M.; costing $2,400; cost of paving 504 square yards $750; cost of fence, 400 feet, $200; erection, $1,200. Total cost of combination span, $7,680

This cost is about $1 per square foot of total floor.

For the all-steel design the quantities were:

Steel 180,000, pounds, costing $7.360; floor-planking, 1,974 M., 1,435 wood joists, 2,224 M. costing $1,435; fence, 400 feet costing $200; paving 504 square yards costing $750; erection $1.200; Total cost of steel span, $10,945

This cost is 1.43 per squre foot of total floor.

The above comparison applies to whole superstructures complete.

Comparing now the cost of substituted parts only, it will be seen that in the combination design, the top chords, web posts, portals, lateral struts, and floor beams contain:

Hard pine, 353 M. at $35. per M. $1,220; cast-iron joint blocks, 19,700 pounds at three cents $5,591; total. $1,811.

For the all-steel design the same parts contain:

Steel (118,200 pounds at four cents) $4,720.

Hence summarizing, we have: Combination bridge costs $7,680, steel bridge costs $10,945; combination chords, etc., cost $1,811; steel chords, etc., cost $4,720. Hence, we may say, roughly, that the combination bridge cost one-third less than the steel one. Also that the comparative cost of wood (including necessary cast blocks) and steel for top chords, web posts, portals, lateral struts and floor beams is as one to three.

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EDITORIAL COMMENT.

The Furnace Hands' Strike. *In perfect harmony with the general conduct of labor leaders, the strike of the blast furnace hands has landed its blow at the wrong place. The spectacle of the furnace hands siding their strongest antagonist, the United States Steel Corporation, against their natural friends under existing conditions, the independent blast furnace operators, is one calculated to bring a smile of pity not only for the strikers but for their fatuous leaders, if the word leader may be permitted in this connection. It is the latest and most acute case of the blind leading the blind, but in general is not dissimilar to hundreds of other instances.*

What the blast frunace hands expect to gain by throwing idle the stacks of the merchant operators while continuing at work for the United States Steel Corporation in the same sections is one of those mysteries which is susceptible of explanation only by labor leaders. If the movement is meant as a threat it is the most childish display of recent years in the labor agitation line. If it is to be taken seriously one is at a loss what to say of it. In its most favorable light, however, it is a spectacle that cannot but be distressing to all except those who are responsible for the movement.

The greatly increased cost of living undoubtedly justifies the men in asking for an advance in their wages, but whether it was politic in them to make an all-around demand for shorter hours and increased pay may be subject to reasonable doubt. Just now the rule is to do overwork, especially in the plants of the United States Steel Corporation and from that angle of view the demand of the furnace hands for shorter working hours and better wages seems to have been badly timed. The United States Steel Corporation appears to have some pride in the relatively favorable average of wages paid in its plants per annum, but it smilingly disregards the fact that the favorable average is earned in working from 12 to 18 hours per day. In some of the plants in the Pittsburg district it has not been unusual for several months for men to work 36 hours continuously and if that rate of earning will not make a favorable average wage at the end of the year nothing will. The blast furnace [illegible] seem not to have been well informed of the [illegible] of working hours under the latest [illegible] ethod.

Their Object Lesson.—An eye of special discern[illegible]ment is not required to observe that the [illegible] of the coal miners of the anthracite dist[illegible] has reached the stage of danger. The dan[illegible] reaches not only to the men themselves [illegible] spreads to points not originally included in [illegible] strike movement. Unavoidably the crisis [illegible] the leaders of the suspension of work scheme [illegible] it forms their weighing in the balance. If [illegible] are not found wanting the majority of the [illegible]ple of the United States will receive a surp[illegible] The strike in itself, standing alone, apart [illegible] all other considerations, was an injury to [illegible] miners. It is not sufficient to assert that the [illegible] decided in favor of the strike themselves. Un[illegible] given circumstances more intelligent men [illegible] the anthracite miners have been duped [illegible] accepting false or exaggerated descriptions [illegible] their rights and privileges. It is undenia[illegible] that the miners of the anthracite districts ha[illegible] grievances in common with the miners of [illegible] bituminous regions, but it is also underst[illegible] that the magnitude of these grievances has be[illegible] greatly exaggerated. Plainly the miners h[illegible] been deluded. Strikes are not the weapons [illegible] which economic grievances are remedied [illegible] wrongs, fancied or real, righted. Strikes [illegible] and often do, accomplish much for the str[illegible] director but they never have and seldom [illegible] accomplish good for the permanent benefit of [illegible] miners. In the present strike, even if the is[illegible] is decided in favor of the men in the end [illegible] permanent benefit will be found on the side [illegible] the strike leaders. There are many method[illegible] dealing with the problem of work and wa[illegible] and the relations of employer and employe, [illegible] annual and biennial strikes are not among [illegible] recognized rational methods. The strike [illegible] have been a good working method in other ti[illegible] long since past, but this is not the age in wh[illegible] to even hope for advantages through the med[illegible] of idle men and starving women and children. To live it is necessary to work, except in th[illegible] case of the trades union leader.

Personals.

A. J. Moxham has severed all official connection with the Dominion Iron & Steel Company, owners of the blast furnaces and steel works at Sydney, N. S., by presenting his resignation as vice president and member of the board of directors.

W. B. Brooks, Fairmont, W. Va., has been elected secretary of the board of trade, of that place. The resignation of J. E. Watson, as president of the board has been accepted. First vice president M. L. Hutchinson was made president.

Joseph E. Schwab, brother to Charles M. Schwab, it is announced, has been slated for the presidency of the American Steel Castings Company, which is being financed by Shearson, Hamill & Company of New York.

The Foundrymen's Program.

The following program has been arranged for the annual convention of the American Foundrymen's Association at Boston.

Tuesday, June 17. Morning session, 10 o'clock—Addresses of welcome and response; secretary's report; treasurer's report; auditor's report; report of committee on the Standardizing Bureau; report of committee on Standard Methods of determining the Constituents of Cast Iron; report of the committee on Standard Sampling of Pig Iron; report of the committee on the grading of Pig Iron by Analysis; report of the Committee on a Foundry Trade School; presentation of the Standard Specifications for Steel Castings as adopted by the American Association for testing materials; presentation of Memorial on the Insuring of Patterns, by Frederick Conlin, of South Bethlehem, Pa.; presentation of a Memorial on the Proper Valuation of Pig Iron for Foundry Purposes, by Dr. Richard Moldenke, New York.

Afternoon—This being a holiday in Boston, an invitation by the city to witness the military and civic parade has been extended to us. Arrangements have been made to attend the ball game of that day for those who prefer it. In case of rain—a business session.

Evening—Theater party.

Wednesday, June 18, morning—From 9-10 a. m. an opportunity will be given our members, through the courtesy of the authorities of the Massachusetts Institute of Technology, to study their very complete engineering laboratory where tests on various materials will be in progress at the time; business session at 10 a. m.; "Some Methods of Increasing Foundry Production," by David Reid, Biddeford, Me.; "Shop Conditions," by Hugh McPhee, Bridgeport, Conn.: "Foundry Costs," by R. P. Cunningham, Holyoke, Mass.: "Cores and Core Arbors," by Edward B. Gilmour, Milwaukee, Wis.: "Shop Tools and Rigs," by James A. Murphy, Erie, Pa.; "Technical Education," by Prof. R. H. Richards, Boston, Mass.; "The Molding Machine,"—Jigs, by S. H. Stupakoff, Pittsburg, Pa.; "The Effect of melting Steel with Iron in the Cupola," by H. E. Diller, Chicago, Ill.

A lecture by Dr. Fay, on the preparation of Metallographic Specimens for the Foundry.

Afternoon—Carriage drive through the Metropolitan Park system, visiting the plant of the Walker & Pratt Manufacturing Company, Watertown, where lunch will be served, after which drives will be continued through Cambridge and Harvard College grounds back to hotel.

Evening—Vaudeville and smoker. Special entertainment for the ladies.

Thursday, June 19.—Morning and afternoon—Boat trip around Boston harbor with dinner at Nantasket Beach and a visit to the plant of the Fore River Ship & Engine Company if arrangements can be made to get there by boat.

Evening—Business session. Ladies will be specially entertained. "The Metallurgy of the Cupola," by Herbert E. Field, Ansonia, Conn.; "Economy," by P. R. Ramp, Schenectady, N. Y.; "Foundry Accounting," by James G. Stewart, North Ormesby, England; "The Molding Machine—Flasks," by S. H. Stupakoff, Pittsburg, Pa. "Brass Melting," by Charles Vickers, Chicago, Ill. ;"Cast Iron," by Percy Longmuir, Manchester, England. A lecture by Albert Sauveur, on the Application of Metallography in Foundry Work, illustrated by projections from the actual specimens of cast iron.

Unfinished business; new business; election of officers; adjournment.

Technical Bodies.

At the regular meeting of the Foundrymen's Association of Philadelphia last evening, A. G. Warren, M. E., of the J. W. Paxson Company, read a paper on the "Paxson-Warren Sand Blast System" for cleaning iron, brass ands teel castings, and removing paint and rust from metals. Patents have been recently granted in the United States and England. The subject was illustrated by lantern slides.

The rod mill of the Sharon Steel Company, Sharon, Pa., was damaged by fire a few days ago, causing a loss of $70,000. The blaze is supposed to have originated from oil-soaked waste catching fire from a spark. Two big engines were destroyed, along with other valuable machinery.

The Season's Ore Movement.

Up to June the amount of ore shipped out of Minnesota for the season will be about 1,800,000 gross tons. This is far above the record for any similar year in the past and an indication of what the roads and mining concerns think of the outlook. There has been a large amount of ore buying of late by scattering independent consumers in the East and Central West, and it's an indication of the strongest kind of what they think of the continuance of present conditions well into 1903.

Most of these buyers have covered all their requirements up to January 1, next, and would not be in the market for more ore unless they had practically made sales of finished productions that assured them of steady business into the early summer of 1903. Many of them actually state that they are sold up, in lines of heavy tonnage, until May, 1903.

There will be shipped from Minnesota this year a larger tonnage of low grade ores than in any preceding year. Ores that four or five years ago would have been thrown away, used for highway for surfacing, mixed with the clay of stripping, or otherwise disposed, will now be shipped. Many of the explorations of the year are finding these lower grades of ore and they are accepted by buyers and even eagerly sought for. Most of these ores are silicious and non-Bessemer, though some carry so small a percentage of phosphorous as to make them fit for the converter. The demand for these ores is an accompaniment of the present activity in steel making and the consequent enormous consumption of iron everywhere.

A new Canadian iron mine, the Wagner, lying about 60 miles North of Sault Ste. Marie, has been opened and will be shipping to the Algoma Steel Company of that place in a few weeks. A road is now being built to it. The ore is a hard hematite, much like some that is mined upon the Marquette range. Stock piles are being rushed forward from all mines on all ranges and the shipments are very heavy on the Vermillion range. The Oliver Iron Mining Company has so developed its Savoy, Sener and Sibley mines during the past winter that they will be large producers this season. The Zenith, which was so serious a development that it sent two concerns into bankruptcy, is now reckoned as one of the finest of the mines of the steel corporation in the hard ore belts. It is very deep and the original operators never had the sand or the money to go down for the ore that was supposed to exist there. It is now a high grade mine.

The new LaBelle mine, at McKinley, on the Mesaba range ,belonging to one of the new independent steel making concerns, has commenced shipment. A steam shovel has been put into the stock piles that accumulated during development last winter, and is putting the ore out very fast.

Several options have been taken on lands lying in the West Mesana range, containing ores, if any, that will be found to be of a very sandy nature. These ores are not silicious, but lie in layers of ore and silica, the latter being free and washable in part at least. It is estimated that washing can be done at a cost of not to exceed 15 cents a ton, and the royalties demanded for these ores are low enough to partly make up for this additional cost. Ores washed are good and are usually hard hematites.

It is expected a very material addition to the gross tonnage of the lake district will be secured by the development and use of these ores. So far the washing process has been merely an experiment and difficulties may arise in connection with the furnace use of ores that will defy solution.

The old Saginaw mine, a few miles West of Ishpeming, on Marquette range, has been taken by the mining branch of the Union Steel Company, one of the new independent steel-making companies. Saginaw was operated in the seventies and not since to amount to anything, but is supposed to be of value. In the same neighborhood the firm of Pickands, Mather & Company has taken the old Portland and United States Steel corporation is at work near the spur. These, with the taking of Dexter and Niagara, two other old mines of the same range, by a large steel-making company, will make things very different around some of once active towns of interior Marquette. A considerable area exists here that will be explored thoroughly at once, and it is believed by many mining men that results of magnitude will be encountered. At any rate thousands of dollars will be spent the coming few months.

The Chicago and Northwestern road is daily receiving about 40 carloads of timber for a new ore dock to be built at Escanaba. The dock will be a large one and of the most modern lines and height. It is claimed by some in authority that the new dock will be the largest in the lakes, even bigger than the Great Northern's latest dock at Duluth, but this is improbable.

On Steep Rock lake, North of the Vermillion range, the Clergue snydicate has a diamond drill at work: Mackenzie has a diamond drill at work and the United States Steel and Marks & Wiley each another. The finds there are reported to be of ore much like the Mesaba in structure.

These lands were located for ore a long time ago, by Prof. R. Pumpelly and others, by no

surface information, but by pure geological reasoning and if ore is found there in quantity it will be of great victory for the theoretical geologist.

Hoisting Machinery Demand.

Pawling & Harnischfeger, Milwaukee, Wis., makers of electric traveling cranes and hoists, advise orders recently booked are partly represented as follows:

The Falk Company, Milwaukee, 30 ton with five-ton auxiliary hoist; Best Manufacturing Company, Pittsburg, two-ton; American Foundry & Construction Company, Pittsburg, two 10-ton; Fairbanks, Morse & Company, Beloit Wis., 15 ton; Warren City Boiler Works, Warren, O., 10-ton; McClintic-Marshall Construction Company, Pottstown Pa., 25-ton; Colorado Fuel & Iron Company, Pueblo, Colo., 20 ton; Kutztown Foundry & Machine Company, Kutztown, Pa., two 10-ton.; James B. Clow & Sons, Chicago, one three-ton; Modern Steel Structural Company, Waukesha, Wis., one 15-ton; Nordberg Manufacturing Company, Milwaukee, one two-ton jib; Pennsylvania Railroad Company, Altoona, Pa., two 12½ ton; The Chapman Valve Manufacturing Company, Indian Orchard, Mass., one 20 ton with two ton auxiliary hoist; The Milwaukee Electric Railway & Light Company, Milwaukee, one 30 ton; Warren Steam Pump Company, Warren, Mass., one 15-ton. Allis-Chalmers Company, Edward P. Allis Works, West Allis, Wis., two five-ton wall and one ½ ton wall.; the Lodge & Shipley Machine Tool Company, Cincinnati, O., one 12-ton; American Bridge Company, Pencoyd Plant, Pa., one 25-ton; Baldwin Locomotive Works, Philadelphia six 10-ton; Gardner Governor Company, Quincy, Ill., one five ton; American Sheet Steel Company, Scottdale Works, Scottdale, Pa., two five-ton specials; The Stilwell-Bierce & Smith-Vaile Company, Dayton, O., two 20-ton; two 10-ton, four five-ton; The Bucyrus Company, South Milwaukee, one three-ton; Midvale Steel Company, Philadelphia, one 10-ton.

A New Tube Cutter.

Another tube cutter has been devised by Walter Hervey, of Chenoa, Ill. He uses a cylindrical bearing arranged to fit inside the tube to be cut and a flange at the outer end to limit the inward movement. Eccentrically journaled in the bearing is a shaft with an antifriction wheel adapted to bear against the tube, the outer end squared to receive a handle lever. At the inner end of the bearing, the shaft is provided with an enlarged portion having a peripheral socket or notch in which is journaled a circular cutting disk disposed eccentrically to the longitudinal axis of the tube. The outer end of the bearing is angular to receive a novel holding device.

The tool is inserted within the tube to be cut and the bearing rotated to bring the cutter into engagement with the tube. This engagement may be maintained, and as the tool cuts deeper, it can be continuously fed to its work.

Another Welding Composition.

A composition for welding steel has just been patented by Charles Pangborn, of Kalamazoo, Michigan. He employs iron chips, 85 pounds; boracic acid, 15 pounds; gelatin, six ounces; water, one and one-fourth quarts. The gelatin is dissolved in the water by heating and added to the chips and thoroughly mixed. Then the acid is added and mixed thoroughly.

While borax and other ingredients have often been used in these compositions, boracic acid has never been employed. The objection to borax is that it crawls off heated steel, making it necessary to repeat the operation and requires careful handling to prevent the compound falling off. By the use of boracic acid, the compound is said to adhere even if the steel is placed in the fire in an inverted position. The steel is said to weld at a lower heat with boracic acid than with borax, lessening the danger of overheating.

A Late Thread Cutter—The Armstrong Brothers Tool Company has control of a patent granted to Samuel Walter and John Armstrong, of Chicago, on a cutting tool designed especially for cutting threads. The usual tool stock is employed. one end of which is disposed at an angle to the main portion, provided with an outstanding ear with a screw threaded opening through it. The cutter is pivoted on this end comprising a body with an edge eccentric to the pivot. The rear edge of the body opposite the cutting edge is also arranged eccentric to the pivot. and an adjusting screw passed through the ear bears against the rear edge.

The cutter is adjusted so that the cutting point or nose is in the desired angular position with reference to the work, readily accomplished by turning the adjusting bolt to just bear against the perimiter of the rear cam-edge when the desired position has been obtained Then the cutter is clamped by screwing down a nut threaded on one end of the pivot. The tool is then fastened in place in the machine or lathe in the usual manner.

The Fairmont & Clarksburg street railway is preparing to build six miles of track.

Total Pig Iron Output.

The position of the United States in the production and manufacture of iron and steel is illustrated by some figures published in the London "Commercial Intelligence," a copy of which has just reached the Treasury bureau of statistics.

The world's total product of pig iron in 1901, it says, amounted to 40,408,000 tons, of which the United States contributed 15,878,000 tons; the United Kingdom, 7,750,000 tons; Germany, 7,663,000 tons; Russia, 3,100,000 tons; France 2,236,000 tons, and the remainder of the world, 3,655,000 tons. Comparing the product of 1901 with that of the annual average for the five-year period 1866-70, it will be seen that the United States has increased its iron steel output far more rapidly than any other nation, the figures being United States, from 1,464,000 tons to 15,878,000 tons, an increase of 985 per cent; United Kingdom, from 5,133,000 tons to 7,750,-000 tons, an increase of 51 per cent; Germany, from 1,226,000 tons to 7,066,300 tons, an increase of 25 per cent; and the entire world, exclusive of the countries mentioned, from 2,710,000 tons to 9,-117,000 tons, an increase of 236 per cent.

An even more noticeable feature of this growth pointed out by the authority from which these figures are quoted, is the steady and enormous growth of the proportion of the world's product supplied by the United States and the equally rapid decadence in the position held by Great Britain. Thirty-five years ago the United Kingdom produced practically one-half of the world's pig iron, while the United States produced less than one-seventh of the total; whereas in 1901, the United States stood first in its proportion of the total, contributing practically four-tenths, as against less than two-tenths by the United Kingdom, and about the same share by Germany.

In the five-year period, 1866-70, the world's per capita consumption of pig iron was 1 pounds; in 1901, it was 57 pounds, while in the latter year the United States consumed 455 pounds per capita, and the United Kingdom 350 pounds per capita.

The effect of this remarkable increase in the production of iron in the United States has been strongly marked in its relation to our foreign commerce. Imports of iron and steel manufacturers in 1882 amounted to \$67,976,897 and formed 9.3 per cent of the total imports; in 1901 they had fallen to \$17,874,789 and formed but 2.2 per cent of the total imports.

On the other hand, our exports of iron and steel manufacturers have grown during the same time from \$20,748,206 in 1882 to \$117,319,320 in 1901. They formed in 1882 about 3 per cent of the total exports, and 15 per cent of the manufactures exported; while in 1901 they formed 8 per cent of the total exports and 28 per cent of the manufactures exported.

The following table shows the production of pig iron in the United States, United Kingdom, Germany, and all other countries of quinquennial periods from 1865 to 1901, stated in gross tons:

	United States Tons.	United Kingdom Tons.	Germany Tons.	All other countries Tons.
1865	831,770	4,819,300	759,700	2,839,300
1870	1,666,179	5,963,515	1,369,139	2,902,200
1875	2,023,733	6,365,462	1,997,317	3,509,736
1880	3,835,191	7,749,233	2,685,909	3,201,248
1885	4,044,526	7,415,469	3,629,158	4,439,221
1890	9,202,703	7,904,214	4,584,835	5,737,993
1895	9,446,308	7,703,459	5,379,041	6,375,800
1900	13,789,242	8,959,691	8,385,885	9,265,200
1901	*15,878,354	7,750,000	*7,736,663	9,042,220

Iron and Steel Association figures.

Opened a New Office.

The American Tool Works Company, of Cincinnati, O, manufacturers of a large line of metal-working machinery, including engine lathes, planers, shapers, upright drills, radial drills, screw machines, brass-working machinery, etc., in order to better serve their increasing trade in St. Louis and vicinity, is opening up a new store in the heart of the machinery district of St. Louis, 720 North Second street at which address, a representative stock of their machines will be on exhibition.

A. B. Bowman, who has been identified with machinery business in St. Lous for a great many years, will be the agent at that office, where he will be glad to receive friends and customers.

Better Ore Transportation.

The extension of the Wisconsin & Michigan railroad to the Iron Mountain ore fields will offer another transportation route for the steel interests of the Pittsburg district and particularly South Chicago. Announcement of the extension has just been received here by the Carnegie Steel Company, which gets much ore from the Iron Mountain ore beds. The extension of the road will run Northwest from Faithorn Junction. The road at present runs from Pesntigo Harbor to Faithorn. The company is mainly owned by Chicago capitalists. It is thought, however, that the road with its new extension will soon be acquired by some stronger railroads

The Sloss-Sheffield Steel & Iron Company is rapidly completing the removal of its convicts from Coalburg near Birmingham to Flat Top on the Warrior river

Want the Combine Restrained.

C. H. Venner & Company, a New Jersey concern, and James Polits of New York have begun action in the New Jersey supreme court, to prevent the consummation of the plans arranged by the directors of the United States Steel Corporation to execute and deliver $200,000,000 of its bonds for the purchase and retirement or the exchange of $200,000,000. of its preferred stock.

They seek to restrain the corporation from carrying out the plans and to prevent the placing of any lien or mortgage upon the property or assets of the corporation to secure the payment of such bonds. George P. Yeaman is counsel for the plaintiffs.

C. H. Venner & Company own 500 shares of common stock of the corporation and Polits owns 100 shares of preferred stock. J. P. Morgan & Company as agents for the steel corporation in financing the scheme, are made parties to the action, together with the officers and stockholders of the corporation. The plan is to issue $250,000,000 of bonds bearing five per cent interest, secured by a mortgage upon the property; to use $50,000,000 of bonds to raise additional working capital and to exchange $200,000,000 bonds for preferred stock.

The result of this, it is asserted, is simply to rearrange the present capitalization of the corporation by increasing its bonded indebtedness $200,000,000. This, it is alleged, will increase the fixed charges of the corporation by about $100,000,000 annually, increase the danger of voluntary dissolution, and endanger the ability of the corporation to pay dividends.

It is said that the plan is in the hands of J. P. Morgan & Company and a syndicate, included in which are directors and officers of the corporation. A commission of four per cent, or about $10,000,000, is to be paid, of which J. P. Morgan & Company will get about $2,000,000 and the syndicate about $8,000,000.

The complaining stockholders allege that the corporation can easily negotiate $50,000,000 of its bonds to raise an additional working capital without the payment of four per cent commission on $200,000,000 of bonds to be exchanged for preferred stock. They allege that no meeting of the stockholders was held to vote on the plan, and that the object is to enable certain holders of preferred stock to become secured creditors.

Furnace Hands Strike.

With exception of the three stacks at the Ohio plant of the National Steel Company, all the furnaces of the Mahoning valley were banked down in accordance with the strike order of the Blast Furnace Worker's union, May 30. In the Shenago valley the majority of them are out.

The following furnaces are out: Girard Iron Company, Brier Hill Iron & Coal Company. Youngstown Steel Company: Hannah and Laura stacks of the Republic Iron & Steel Company, and the Struthers Furnace Company. Sharpsville, two Douglass. Alice. Spearman, Mabel, Clare and old Sharpsville; Sharon, Hall of the Republic company Stewart Iron Company, two in West Middlesex.

The blast furnace workers are paid as follows: Keeper, $2.50, 12 hours; engineer, $2.50, 12 hours; top filler, $2.25. 12 hours; helpers, $2, 12 hours; filler's helper, $1.80, 12 hours laborer, $1.50 10 hours; water tender $2.15 12 hours; fireman $2, 12 hours; wiper $2, 12 hours.

Negotiations are underway for settement and work may be resumed at any hour. Several operators are willing to pay the wages asked.

Rumors of Change Denied.

Rumors of an approaching change in the management of the affairs of the Crucible Steel Company of America, which have been afloat for sometime, were started anew last week. The rumors say that H. C. Halcomb, president of the company, would resign. In such a contingency the men named for the vacancy were Reuben Miller, W. P. Snyder and Frank B. Smith, the latter the general manager of the company and lately its secretary. President Halcomb denied the accuracy of the stories.

All Departments Running—The rolling mill department of the new Colonial Steel Company, at Colonia, near Monaca, began operations late last week. The dimensions of the building are 170x640 feet. The beginning of work in the rolling mill department practically completes the erection of the plant started about a year ago. The crucible and hammer departments began operations several months ago. The product is crucible steel. It has been decided to enlarge the crucible department. The ouptut of this department is to be doubled. Work on the extension will begin at once and four months at least will be required to complete it. The advisability of erecting an open-hearth steel plant is also being considered, though this is not likely to be carried out in the near future.

At the plant of the Youngstown Iron Sheet & Tube Company the big 52-inch sheet mill was put in operation last week. This makes six in all, the 38 inch having started up previously. In all the company expects to operate 16 sheet mills. Work on their erection will be deferred until the tube mills are made ready, which will be next month.

IN AND ABOUT PITTSBURG.

The Pittsburg, McKeesport & Connellsville Street Railway Company has placed contracts with the Westinghouse Electric & Manufacturing Company and the Westinghouse Machine Company for equipment which will double the power plant of the interburban traction system. The orders placed with the Westinghouse interests are for three 1,500-horse power Parsons turbines and three 1,000 K. W., Westinghouse generators. The traction company some months ago, contracted for three 1,500 horse power engines to be furnished by the Allis-Chalmers Company of Milwaukee and are to be the vertical compound condensing engines.

A meeting of the stockholders of the Sharon Steel Company has been called for August, a vote will be taken to increase the capital stock $1,000,000. The present capitalization is $5,000,000. The increase will be required to complete improvements now under construction. Among the improvements are four open hearth furnaces which will be ready to start by the first of August, and will add from 800 to 1,000 tons to the daily capacity of the company. The pipe mills as well as twelve steel mills will be ready to start by August 1. These will have a daily capacity of over 100 tons.

The William B. Scaife & Sons Company, this city, has contracted to install at once water purifying and softening systems for the following named concerns: Hecla Portland Cement & Coal Company, Bay City, Mich., 1,500 horse power; same company's plant at West Branch, Mich., 500 horse power; A. A. Simonds & Son, Dayton, O., 200 horse power; American Sheet Steel Company, New Philadelphia, O., plant, 1,500 horse power; Isaac Harter Company, Fostoria, O., 1,000 horse power; National Mining Company, Sygan, Pa., 1,000 horse power.

Ground has been broken for another furnace to be added to the Carrie group of the Carnegie Steel Company at Rankin. The plant at present has four furnaces of 900-ton capacity each, and since the hot metal route between the furnaces and the Homestead Steel works has been established more furnaces are needed. The new stack will be of 800-ton capacity, as this size is said to have proven the best.

Elmer E. McIntyre, South Main street, this city, and others, are forming the National Foundry & Machine Company to build a plant for the manufacture of rolls and rolling mill machinery. It is probable that the works will be located along the Pittsburg, Carnegie & Western branch of the Wabash railroad.

Mackintosh, Hemphill & Company of this city, have received the contract to install a 32-inch blooming mill for the Deering Harvester Company, South Chicago, Ill. The latter company intends making a number of improvements to its plant consisting of 14 open hearth furnaces, each with a capacity of 40 tons; 8, 9, 12 and 16 inch merchant mills; 22, 26 and 28 inch plate mills and a 22-inch blooming mill. Julian Kennedy, of this city, has the engineering of the work.

The world's record for manufactured steel plate was broken during the month of May by the 128-inch plate mill of the Carnegie Steel Company at the Homestead works. The output for the month was 14,500 tons. The better previous record was 14,300 tons, held by the same mill, which was made during last winter.

Sealed proposals will be received at the office of the City controller of Pittsburg until the 9th inst., for erecting a machine shop at Brilliant pumping station also for the furnishing and erecting one traveling crane in machine shop at Brilliant pumping station.

The Dallenbach Gas Engine Company, recently organized in this city will probably absorb the plant of the Ellwood Gas Engine Company at Ellwood City and greatly enlarge the plant, adding a casting house, complete with all modern appliances.

The Allis-Chalmers Company have placed an order with the Pittsburg Gage & Supply Company, this city for a complete "White Star" filtering system to be applied to two of their engines destined for improvements in the plant of Jones & Laughlins, this city.

Sixty machinists employed at the Pennsylvania Engineering Works, New Castle, struck on Monday last leaving none but the apprentices at work in that department. The trouble rose over a demand for an increase in pay of 10 per cent.

The contract for the engines to be installed in the Farmer's Bank building this city, has been awarded to the Phoenix Iron Works Company, Meadville, Pa. The contract calls for one 450 horse power and another of 400 horse power.

Fire destroyed the Robinson Machine Company's plant at Monongahela City, May 30, causing a loss of between $75,000 and $80,000. The firm manufactured mine haulage machinery, tipples and fittings for coal mines.

The Pittsburg Gage & Supply Company, Water street, has secured the agency for the sale of the Tudor water tube boiler, manufactured by the Tudor Boiler Manufacturing Company, Cincinnati, O.

NOTES OF THE INDUSTRIES.

The Zanesville Malleable Iron Company a new concern composed of Detroit and Zanesville, O., parties, are now preparing to erect a modern foundry plant, for the manufacture of refined air furnace malleable castings. The main buildings will be 280 feet long with two wings. The contract for buildings has been awarded and work will be pushed on new plant with a view to having same in operation August 1. None of the machinery or equipment has been purchased and the company is in the market for one 100 h. p. boiler and 75 h. p. engine. R. H. Frees. is president, J. D. Brennen vice president and manager and S. H. England, secretary and treasurer. A temporary office has been opened at 10 Sharp building Zanesville, O.

The annual meeting of the stockholders of the William Cramp & Sons Ship & Engine Building Company, Philadelphia was held last week. The present board of directors was re-elected. Charles H. Cramp was elected president; Edwin S. Cramp, vice president, and Charles T. Taylor, secretary and treasurer. An issue of bonds to the amount of $4,000,000 was authorized, recent purchases of property in the neighborhood of the big plant and the erection of new buildings having cost very nearly that amount. The usual quarterly dividend of 1¼ per cent was declared.

Limestone shipments from the Altoona division of the Pennsylvania road have recently broken all record. The Crucible Steel Company has secured the limestone quarries on the farm of Andrew J. Patterson, at Franklin Forge, Blair county, along this division of the road, and will start at once to put in a siding and a large iron bridge across the Juniata river, which must be crossed. This company proposes to turn out 60 cars of furnace stone daily for shipment to Pittsburg.

The general contract for the superstructure of the new foundry building for the Interstate Foundry Company, Cleveland, O., has been awarded to Hunkin Brothers. Plans were prepared by Katenbach & Griess engineers. The building will be thoroughly equipped with modern machinery and heavy traveling cranes of 100 tons capacity, and smaller ones. The foundation is completed, and the contract for structural iron and steel awarded to the American Bridge Company.

The Nelsonville Brick Company of Nelsonville, O., is erecting a new plant for the manufacture of a general line of high grade fire clay products. Most of the machinery has been purchased and work is being pushed on the plant. Besides fire and paving brick this company will make a specialty of high grade ground fire clay. The company expects to have the plant in operation early in August and will have a daily capacity of 50,000 brick.

Shipments of coal and coke originating on the lines of the Pennsylvania Railroad East of Pittsburg and Erie for the week ending May 24, aggregate 694,725 tons. Of this amount 6,745 tons were anthracite, a decline of 1,122 tons from the previous week; 486,400 tons were bituminous, a decline of 19,573 tons. Shipments of coke, which amounted to 201,580 tons, increased 6,367 tons over the week previous.

The B. & O. Railroad Company expects to make improvements in the Fairmont, W. Va., yards this summer to the extent of $350,000. A 22-stall round house is to be built, and will measure 180 feet from the centre of the turn table to the walls of the building. The turn table will be 80 feet in diameter. Near the round house a coal trestle and sand house will be erected.

The damage at the recent fire at the rod mill of the Sharon Steel Company at South Sharon, Pa., will not be as heavy as at first reported. It is believed that the big engines can be repaired. This will cut the loss down by several thousand dollars.

The Tidewater Steel Company, Chester, Pa., and the Suburban Gas Company, of Chester, have entered into an agreement to erect 60 by-product coke ovens, with an estimated output of 300 tons a day. The gas company will erect the furnaces and furnish the gas to the steel plant.

The Republic Iron & Steel Company will put its furnace at Thomas, near Birmingham, Ala., in blast this week. The machinery has been adjusted. The furnace is the newest and most modern in the South.

The Calumet Coal Company has been organized by R. C. Middleton, of Birmingham, congressman J. H. Bankhead and J. H. Bankhead, Jr., capital $ 00,000. They will mine coal near Jasper, Walker county, Ala.

C. B. Keene, Philadelphia, will shortly send out plans for a two-story brick extension, 50x80 feet, to the crane shop of the Link Belt Engineering Company at Nicetown, Philadelphia.

The nail mill of the Sunbury Iron Works, Sunbury, Pa. was totally destroyed by fire a few days ago. The plant contained 41 nail machines and had a capacity of 120,000 kegs annually.

The Diamond State Steel Company, Wilmington Del., will build an addition to its works to cost $8,000.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—Some degree of additional strengt h and steadiness for tne benefit of the timid in the markets has been given by the virtual announcement of the United States Steel Corporation companies that in general the values for next year's delivery will be on a level with the ruling prices on this year's contract deliveries. The statement has not been made in formal definite announcement that prices are to be certain specific figures for 1903 delivery but the statement is made directly that the plants of the United States Steel Corporation are accepting new business, that is for 1903 delivery at the ruling prices. Steel rails standard se:tions are quoted at $28 at Pittsburg mill and $1.60 is quoted for plates and structural shapes. While the Steel Corporation is not unalterablv committed to these limitations there is strong assurance in the mere fact that the Corporation companies are accepting business at those prices. It seems to mean that there will be no material change in values for next year's deliveries except perhaps for spot shipments. That, however, is not different from this year and consumers who again delay and expect to find themselves promptly supplied as their necessities require may reasonably expect another disappointment unless in the event of a serious decline in the iron and steel markets. Considerable tonnage in plates, rails and structural shapes has been placed for 1903 delivery at the figures named and the further announcement is made unofficially that the present outlook does not appear favorable for advances on plates and structural except for spot shipments which few if any plants are able to promise.

In the raw material markets tne situation is not appreciably different from the past several months. The supply of pig iron and billets on contracts is satisfactory but there is the same trouble for the belated buyers in trying to secure a supply of pig iron and billets at any price. Values for spot delivery are still inclined to crawl upward and that condition will no doubt applv to all the rest of the year. Bessemer pig has reached $22 at valley furnace but there is little or no iron to be had even at that as the furnaces are more concerned in maintaining the supply of material to their customers than in reaching out into the market for high prices. Probably 5 per cent of the product of the merchant blast furnaces has been sold for approximately $15 to $15.50 per ton, although some tonnage sold for $16.00 at valley stacks. Billets are still ranging about $34-$35-$36 per ton at mill but the situation there is not different than in the case of pig irons. Mill iron is strong at $22.25 at Pittsburg, while the foundry irons are almost impossible to buy at any price although occasional small lots have been sold for as high as $22.50.

The difference between the relatively high price of spot iron and the relatively conservative values quoted on the larger steel products for next year is to be bridged probablv by the filling of the deficiency in the case of the United States Steel Corporation in its furnace capacity. But even if that is not the case there is nothing so far to indicate that the furnace operators of the merchant interests are not disposed to continue next year's tonnage delivery on the basis of this year's business. Bessemer at, say, $16.00 per ton at furnace, or $16.75, Pittsburg delivery, is a fair to good price if other values are not permitted to run into excess and the furnace interests are not disposed to insist upon the highest prices while the values on finished steel are maintained on a conservative basis as at present and for the arlier portion of 1903 as indicated by the quotations named by the United States Steel Corporation companies.

CURRENT QUOTATIONS:

Basic	$20 50	22 75	Splice bars	1 50	
Bessemer		22 75	Angles	1 60	
Charcoal, hot	82 00		I beams	1 60	
Charcoal, cold	32 50		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 70
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	36 00		No. 1 cast	17 00	17 50
Open hearth	37 00		Iron rails	25 00	2[illegible] 00
Steel bars	1 80		Car wheels	18 00	19 00
Iron bars, refined		2 10	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	3 00	
Bolts, iron, sq nut	2 50		Sheets, 27	3 10	
Hex nuts	2 65		Sheets, 28	3 20	
Spikes	2 00				

Philadelphia—The iron and steel market continues exceedingly strong and the scarcity of metal is becoming scarcer almost every day. Very little pig iron or steel can be had for the balance of the year, but most of the large interests are fairly well covered. There is, of course, a great shortage of pig iron as compared with steel making capacity, but it is a question whether, if there were enough pig iron to keep all the steel mills running to their full capacity, there would be consumption for the finished material which would thereby be produced. If prices continue at their present level there will be a good deal of consumption already planned, but deferred for various reasons, which may take the output of the new blast furnaces which are being built or are definitely projected.

Prices in the local pig iron market are very

firm, but buying is limited. Inquiries have fallen off, but it is known that there are large requirements to cover. The strike in the anthracite coal regions threatens to precipitate complications and to put consumers to a great deal of inconvenience. Two or three furnaces are reported to have gone out of blast, and more will probably follow, as the supply of fuel at most of the furnaces is scant. A fair average for the standard brands of Northern iron for the last four months of the year for deliveries in Philadelphia or at nearby points would be about as follows, earlier shipments at anywhere from $1 to $1.50 additional: No. 1 foundry, $20.50 to $21.50; No. 2 foundry, $19.75 to $20.50; gray forge, $18.50 to $19.

Domestic steel billets are still very scarce, it being difficult to purchase anything of moment for early delivery at any price. Nominal quotations for American steel are $34 to $35; English, $31.50 to $32.50, and German, $30 to $30.50. Some foreign steel has arrived and more is due.

The one dominant feature of the finished iron and steel market is the fact that every thing is scarce and prices higher than actual quoted rates reasonably prompt deliveries varying from $2 to $10 per ton. The prospect for business is considered excellent, the only difficulty at present being to get full supplies of material, and in some cases to differences in regard to wages.

CURRENT QUOTATIONS:

Foundry, 1..........	$20 50	21 50	Girder rails..........	32 00	32 50
Foundry, 2..........	20 00	20 50	Angles, 3" & lr'gr		1 80
Gray Forge..........	18 50	19 00	Under 3-inch........		1 90
Bessemer billets...		34 00	T's 3" and larger...		1 85
Open h'rth bil'ts...	35 00		Under 3-inch......		1 90
Steel bars..............	1 70	1 80	Heavy plates.......		1 80
Refined iron bars..	1 90		Beams and chanls		1 85
Standard rails......	28 00				

New York—The semi-feverishness incidental to the attempt to uncover the basis of the United States Steel Corporation companies for next year deliveries has subsided under the impression gained without much effort that the Corporation proposes to maintain its attitude in favor of conservative values all through the iron and steel products. There has been easier breathing as the eagerness to invest in construction work had come to amount to almost a fear that the current values on spot deliveries might be extended into next year's business to cover the general run of prices. Now that this has been determined in favor of a conservative basis of value it is expected that forward buying will begin and that within the next few weeks a definite outline of 1903 requirements will be made plain in the market movements.

The principal suffering in the Eastern section of the country is among the foundries which have been short of ready material for months and have not succeeded in finding a ready way out of their troubles. Prices for prompt shipments have been advancing until the impression became conviction that relief need not be expected during 1902.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City.......	$20 65	21 00	Angles..................	2 00	2 50
No. 2X fdy Jersey City..................	21 50	22 50	Tees......................	2 00	2 50
No. 2 plain Jer. C.	19 25		Zees......................	2 00	2 50
Sohn. 1 fdy N. Y..	22 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y......	21 00		Com. base, bars per 100 lbs.........	1 65	1 70
No. 3 fdy N. Y......	20 50		Refined base, bars	1 85	1 90
No. 1 soft.............	17 75		Bands, base.........	2 40	2 50
No. 2 soft.............	18 00		Norway bars.........	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes....	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.....	2 30	2 40	Old T rails, iron f. o. b. cars.......	20 00	21 00
Sheets, blue annealed, 10..........	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs.........	1 90	2 00	No. 1 wro't scrap iron f o b cars....	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock............	2 50	2 50	Old wrought pipe and tubes..	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5	to 70 & 10	Old car wheels, f. o. b. cars..........	16 00	17 00
Beams and chan'ls 15-in & under....	2 00	2 50	Old ham. car axl's f. o. b. cars.......	22 00	23 00
			Wrought turnings deliv. at mill.......	11 50	12 00

Chicago—There are conflicting conditions this week and it is difficulty to gauge the market for finished products. Pig iron seems to be wholly strong, however, for very little is offered and wants are large. The large inquiries from extreme Eastern points continues a feature of trade, but few of these inquiries end in purchases, for sellers either decline to quote or name a prohibitive figure in most instances. Prices are much the same as a week ago. Spot iron is in good demand and readily commands a premium of a dollar or more over quotations at which iron can be bought for shipment during the last quarter of the year or later. Even for the latter deliveries it is not easy for melters to buy material.

Actual transactions in finished material have drifted almost entirely away from the basis of the nominal quotations, which mills have been maintaining for months past. The store trade is of a vigorous and steady character and the high prices recently obtained are as a rule easily held. There is reported fresh inquiry for rails. Structural shapes are selling in fairly good lots for shipment next year and prices are generally without change. Jobbers seem fairly well stocked with tubes and sheets also are to some degree neglected.

Some dealers on old material say quotations are inclined to sag a trifle. But if this tendency is present, it has not yet developed sufficiently to become marked. The market is generally steady with a fair volume of business current.

CURRENT QUOTATIONS:

Bessemer...............	22 00	23 00	Sheets, 26 store.....	3 25	3 40
Fdry Nohn 1........	21 50	22 50	No. 27...................	3 35	3 50
Northern 2...........	21 00	22 00	No. 28...................	3 45	3 60
Northern 3...........	20 50	21 50	Angles	1 75	
Southern 1...........	20 65	21 65	Beams...................	1 75	
Southern 2...........	20 15	21 15	Tees	1 80	

Southern 3	19 65	20 65	Zees	1 75	
Forge	19 15	20 15	Channels	1 75	
Charcoal	22 50	23 50	Steel melt'g scrap	18 00	18 50
Billets, Bessemer	34 00	36 00	No. 1 r.r. wrought	20 00	21 00
Bars, iron	1 85	1 95	No. 1 cast, net ton	15 00	16 00
Bars, steel	1 75	1 85	Iron rails	24 00	25 00
Rails, standard	28 00		Car wheels	20 00	21 00
Rails, light	34 00	40 00	Cast borings	10 00	11 00
Plates, boiler	1 90	2 00	Turnings	13 50	14 00
Tank	1 75	1 80			

Cincinnati - There is no iron selling, for the furnaces are practically out of the market. There has been the usual talk of a scarcity of pig iron and the impossibility of consumers obtaining supplies, and it appears to have been overdone. The reports are that the recent advance has been fully sustained and that nobody has been able to buy any iron for delivery before August, but there has been a good business in deliveries from August to December inclusive. During the past two weeks the remnants which he Southern producers had free to sell have been taken, and there is now only an inconsequential balance left. This balance will be in the shape of odd lots from time to time. The Ohio furnaces are in precisely the same condition as those of Alabama and Tennessee. So the situation for 1902 is pretty well fixed and certain. Consumers who are not fully covered, and fortunately there are not many of them, will find themselves in hard lines.

The market is firm. The demand is greater than is offered, and it is agreed by a number not to offer iron for 1903 until the last quarter of this year. However, sellers say they may, within the next month, be offering iron to be delivered during 1903.

Bars continue to sell well and plates are called for beyond the capabilities of the market to respond. Structural material is not abating its high prices and trading is necessarily limited. Sheets are in moderate demand, with steady quotations.

In finished products the market is continuing on its recent path of strength and scarcity. The little lots that are offered find an easy sale at the prices given.

CURRENT QUOTATIONS:

South fdy 1	20 25	$20 50	Standard Sections	29 90	30 90
South fdy 2	19 75	20 00	Sheet, 26	3 40	
South fdy 3	19 25	19 50	Sheets, 27	3 50	
South fdy, 4	18 75	19 00	Sheets, 28	3 60	
Grey forge	18 75	19 00	Angles, 3 to 6 in	1 70	
Mottled	18 75	19 00	Angles, 1½ to 2½	1 80	
South 1, soft	20 25	20 50	Beams and Chan'l 15 in and under	1 70	
South 2, soft	19 75	20 00	I B'ms 18, 20 24 in	1 80	
L. Superior fdy. 1	22 00	22 50	Tees	1 75	
L. Superior, 2	21 00	21 50	Z's	1 70	
L. Sup'r char'l c'n	22 00	23 00	1 wrought scrap	19 00	20 00
Hang'g r'k c'ol, 1	26 00	28 00	Steel melting stock gross ton	15 00	
Southern c'ol c w	20 50	20 60	No. 1 cast	18 00	
Jackson co's'v'l	21 50	22 50	Old iron rails g't'n	22 00	
Steel bars base b'ces	1 75		Old car wheels	20 00	
Iron bars	1 82		Cast borings	8 50	9 00
Forge plates	1 90		Turnings	12 50	
Tank steel	1 70				
[illegible] fire-box	1 40				
Light rails	33 00				

Birmingham.—The basis of No. 2 foundry at Birmingham is still the basis for spot dealings. The prices of last week have stiffened to that point and there is no indication that there will be a drop. The demand is insistent and many small sales are made. Probably the large consumers, when they are accommodated for next year's delivery, will get in on a basis of $16 for No. 2, but all immediate sales are on the $17.50 basis. Incidentally the local foundries lately complain that the furnaces are not running as much No. 2 as they might, but that lower grades are the principal product. Coke has gone up from $3.75 to $4.25 and is an article hard to get at that price. Several foundries are importing coke from Powhatan, W. Va., paying $17.25 on delivery here, but they say the West Virginia coke melts so much more iron that it makes up for the increased cost. The leading event of the week was the announcement that the Sloss-Sheffield Steel & Iron Company had acquired all the interests of the Lady Ensley Coal, Iron & Railroad Company, a corporation organized years ago by the late Col. Enoch Ensley, of Memphis. This property had been in litigation for years. It includes vast coal acreage and mines in operation at Horse Creek, two hundred coke ovens at the same place, brown ore mines, etc., at Russellville, and two blast furnaces at Sheffield. The Sloss company already owned one of the Ensley furnaces at Sheffield, but it and the Tennessee company had rival claims to the Lady Ensley furnace there. The Sloss buys out that claim. The entire deal is said to have stood the Sloss company about $600,000 but the properties are among the best in Alabama. The Birmingham Belt is endeavoring to hamper the Seaboard Air Line in its entrance into Birmingham, but the effort is not expected to amount to much. It is understood that the Belt desires $1,000,000 from the board for its purchase and that the Seabord is trying to get it for less. The rolling mills come to the end of the first half of the year with all wage matters settled both of Georgia and Alabama and with as many orders as the plants can possibly fill for some time to come. The water pipe plants have been compelled to decline rush orders. The machine shops of the larger type are building a number of heavy Corliss engines both for the Birmingham district and for cotton oil mills and other plants in surrounding states.

CURRENT QUOTATIONS:

No. 1 fdy. Sohn	$17 50	18 00	Tank	1 90	
No. 2 fdy. Sohn	17 00	17 50	Steel smelt'g scrap	14 00	
No 3 fdy. Sohn	16 00	16 50	No. 1 wrought	14 00	
Grey forge, Sohn	15 50	16 00	No. 1 cast	12 00	
Billets	28 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	3 20	3 50
Fire box	2 00				

Coal.

Pittsburg—The scarcity of cars and the lagging movement at the lake docks form a handicap to the Pittsburg district coal industry that is difficulty to over estimate. The season's operations have been seriously disarranged by the railroad deficiency and the squabbles at the lake points and will fall short of the earlier anticipations. The local supply of fuel is well maintained.

Cincinnati—While this market is short of anthracite coal, dealers are not complaining for there is a fair supply of bituminous coal. There is a reasonably fair supply of bituminous coal in the yards, enough for perhaps the next three months, so there is no danger of a famine. Lump at wholesale is selling at $2.25 on the cars; run of mine at $2.00; and slack, which is very scarce, at $1.50 when it is to be had.

Cleveland—The coal situation is unchanged. Shippers continue to complain of a shortage of cars for the movement of coal, while the owners of boats aver that cargoes are plentiful. The two statements may be harmonized by the statement that, comparatively speaking, the month of May of other years being taken into consideration, the supply of coal is short although there is a goodly quantity coming in all of the time. Cargoes for smaller boats are plentiful, and the fact that the larger boats have withdrawn from the coal trade makes it appear as if a larger per cent of the boats engaged in the trade are busy than the figures would in reality show.

Chicago—There is now a quite perceptible buying movement among large consumers of steam coal, in anticipation of possible strike complications in the West. It has not yet advanced prices generally but the tone of the market is decidedly stronger. Some grades are becoming quite scarce. This is true of most Eastern products and of the coals mined on two or three of the North and South lines running through Illinois and Indiana, where a shortage of cars is reported. Fine coals are becoming so valuable that prices closely approximate those of mine run. Washed screenings sell at a considerable premium over mine run. Receipts from the East are not large. Anthracite is moving from docks moderately well, with stocks continuing considerable. Coke is in good request and prices are firm.

Coke.

A summary of the Connellsville region for the week shows 20,618 ovens in blast and 668 idle.

The following figures show the scope of operations.

Production for the week	245,828 tons.
" last week	243,977 tons.
Increase	4,851 tons.
Shipments—	
To Pittsburg and river points	3,790 cars.
To points West of Pittsburg	5,730 cars.
To points East of Everson	2,686 cars.
Total	12,206 cars.
Last week	11,889 cars.
Shipments in tons for week	254,800 tons.
" " " last week	247,569 tons.
Increase	7,231 tons.
Masontown Field	
Shipments for week	607 cars.
" last week	678 cars.
Decrease	71 cars.
Shipments in tons	15,789 tons.
" last week	17,628 tons.
Decrease	1,939 tons.

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha $4.60 Stonega, $4.60

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	11.00	c
Copper, light bottoms	9.50	c
Heavy Composition	11.00	c
Brass Turnings	7.00	c
Heavy Brass	8.00	c
Light Brass	6.75	c
Heavy Lead	3.80	c
Tea Lead	3.60	c
Zinc Scrap	3.25	c
No. 1 Pewter	21.50	c

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots......34c.
100 lb. " ....35c. "	ton lots and over......33c.

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ....35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots: lots of 100 pounds, $1.10 per lb.: special price on large lots

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including June 2, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	Shipments.	Runs.
Transit	924,128	334,262
Tidewater	337,702	114,641
Southwest	63,388	306,264
Eureka	87,361	1,106,432
Buckeye, Macksburg oil	9,239	457,259
New York Transit	794,249	
Southern	865,768	......
Crescent	209,312	......
Total	3,241,489	2,529,679
Daily averages	104,562	81,602
Buckeye / Indiana Local Division	1,478,677	1,718,576
Daily average		55,438

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
May 28	$1.85	$1.20	$1.20	$0.88	$0.83	$0.83
May 29	1.85	1.20	1.20	0.88	0.83	0.83
May 30	1.85	1.20	1.20	0.88	0.83	0.83
May 31	1.85	1.20	1.20	0.88	0.83	0.83
June 2	1.85	1.20	1.20	0.88	0.83	0.83
June 3	1.35	1.20	1.20	0.88	0.83	0.83

The Metal Markets.

LONDON—Tin—£136-£135 10s. Sales, 490 tons spot; 870 tons futures.

Copper—£55-£53 17s 6d. Sales, 1,825 tons spot; 1,750 tons futures.

Lead—£11 10s-£11 3s 9d. Spelter—£18 7s 6d-£18 5s.

NEW YORK—Tin—$30.35-$30.12½.

Copper—Lake, $13.00-$12.65 electrolytic, $12.50; casting, $12.37½-$12.25.

Lead—$4.15.

Spelter—$4.75.

ST. LOUIS—Lead—$3.97½-$3.95½.

Spelter—$4.55--$4.50.

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4 10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4 75

Ore Situation at Cleveland.

The welcome news came at the close of business last Saturday that unless all plans fail there will be a relief from the crowded condition of the Lake Erie ore docks by the middle of next week. This report is almost too good to be true, yet it is vouched for by those who are in a position to know. For the last month vessels have been constantly delayed at the Lake Erie loading ports, and it seemed that there was to be no end to the annoyance. The vessel men and the shippers have gone over the ground very thoroughly, and have come to the conclusion that the delays have been due directly to the lack of cars with which to move the material away from the unloading ports when the ships discharge their cargoes. The middle of last week the shippers and boat owners alike looked with dread at the coming holiday, as it promised to detain the boats longer at the docks and might tie up the fleet here until the beginning of the week, or even into the middle of this week. When the holiday had passed and the shippers and vessel owners renewed their importunities to the railroads to afford more facilities, it is said that all of the rail lines agreed to give both more cars and more locomotives. It seems that engines are what the railroads have lacked, and by some arrangement or other enough engines have been sent to the lines connecting with the lakes to relieve every distress. Some of those who have charge of the lake docks are now predicting that by the middle of the week about every dock on the lower lakes will be clear of boats, or at least cleared to such a point that the blockade will be stopped and that long delays will be the exception rather than the rule.

The immediate effect of such a change upon the market is not easy to figure out. The demand for boats at the head of the lakes is just moderate, and about even now with the supply. There has been some talk that when boats are more plentiful at the head of the lakes the shippers will break down the rates. Whether this threat will be carried out is a matter yet to be determined, but the ship owners do not like the prospect of emerging from a period of costly delays at the unloading ports only to be faced by the further annoyance of having to fight to maintain the rates of carriage. The most serious problem for the vessel owners to face such a contingency is that there is no assurance of permanency in the promised relief from delays, consequently they are unable to calculate the comparative earnings under delays, and under a reduced rate of carriage.

The statistics of the treasury department show heavier imports of crude steel, the imports during April of billets, ingots, blooms, etc., amounting to 11,987 gross tons. The imports during the first three months of the year were 14,118 tons, showing that there was a very decided increase in April. The imports of pig iron increased, only slightly, or from 17,184 tons during March to 19,067 tons during April. In the matter of exports the figures show that in some lines the shipments abroad have declined, while in others they have increased.

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Electric Hoists

Are operated either by an alternating or a direct current motor.

The gears run in a bath of oil, and are completely enclosed in an oil-tight and dust-proof iron case. We build these hoists in sizes from 5 to 150 h. p., with drums, clutches, brakes and other parts, of generous proportions. They are especially built for service where heavy and continuous work is required.

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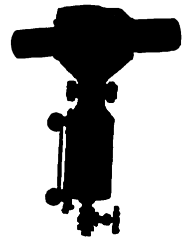

Cochrane Oil Separators

Are common sense, practical appliances, for taking oil out of exhaust steam, which they will do so thoroughly that the steam thus purified can be safely used for heating water by actual, direct contact, for boiler feed and other purposes; or the steam purified can, when condensed, be safely returned to boilers.

All Separators will take out some oil. We believe that the **Cochrane Oil Separators** will take out rather more oil than any other.

Thousands of well known concerns are using **"Cochranes"** and obtaining most satisfactory results. Write for Catalogue "2-S."

Harrison Safety Boiler Works

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BECAUSE

When Once Used, We Have Never Failed to Retain the Customer.

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FRICK & LINDSAY CO.,

109-111 Wood St., Pittsburg, Pa.

Industrial Notes.

The Alabama Consolidated Coal & Iron Company has issued orders and let contracts for the enlargement and modernizing of its frunace at Gadsden. It will be made a 200-ton per diem plant. The company has also opened a large new red ore mine near Gadsden.

The new furnace of the Republic Iron & Steel Company at Thomas, Ala., has had the fires lighted in its boilers for ten days and the machinery is being adjusted. The furnace will go into operation in the next few days, making over 200 tons of iron per day.

The formal transfer of the Alice Furnace at Sharpsville, Pa., owned by Pickers, Mather & Company, of Cleveland, to the Youngstown Iron, Sheet & Tube Company, Youngstown, O., was made Monday last.

The Dimmick Pipe Company shipped this week to Philadelphia a consignment of cast-iron valves valued at $15,000, the largest shipment ever made in that direction from a Southern plant.

The puddling furnaces of the American Steel Hoop Company in Warren, O., a portion of which has been idle owing to the lack of puddlers, were fired Monday last.

An independent steel plant will be established at Parkersburg, W. Va., by the West Virignia Iron & Steel Company with $250,000 capital.

The Tennessee Coal, Iron & Railroad Company is nearing the completion of the big water purifying plant at the steel plant in Ensley, Ala.

The new plant of the Jackson Iron & Tin Plate Company, Clarksburg, W. Va., will be started up in full within a week.

West Virginia News.

The B. & O. has awarded a contract to Furgeson & Son, of Newark, O., for 22-stall round house at Fairmont, machine shop, blacksmith shop and store room at the same place. The ame company will build a large apartment house for the use of its employes in the Fairmont coal district. The B. & O. has mapped out improvements there that will cost $350,000.

The Charleston, Parkersburg & Weston Railroad Company, just formed, proposes building a road from a point near Charleston to Parkersburg thence to Weston. Principal office is at Charleston; incorporators, R. S. Spillman, Harrison B. Smith, Elijah Steen, T. E. Courtney and E. B. N[illegible]. Authorized capitalization is $100,000.

The Jackson Iron & Tin Plate Company, with a capacity of 70 tons of finished product daily started last Monday.

B. F. Bailey, one of the projectors of the Grafton electrical railway states that plans for the road will soon be in process of formation. About six miles of track will be built this year.

The John Schauwecker tannery at St. Marys was destroyed by fire a few days ago. The loss is $15,000. It is likely the plant will be rebuilt at once.

Henry Schmulbach, of Wheeling, will build a traction line between Sistersville and Middlebourne. The road will likely be extended shortly to West Union.

J. E. Barnes and A. J. Cochran of Uniontown, Pa., paid $156,000 for 11,000 acres of coal in Harrison county.

The United States Iron & Steel Company of Parkersburg, has applied for a charter and will build a steel plant at that place.

Patents.

The following patents granted May 20, 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Apparatus for washing coal, coke, etc.. Cuthburt Burnett, Grange, England; ore bucket, dumper, and chute, Louis Collier, Cripple Creek, Colo.; elastic fluid turbine, C. G. Curtis, New York; muffler, A. L. Kull, Camden, N. J.: boiler furnace, Frederick Sargent, Chicago; magnetic clutch, F. L. Sessions. Oakpark, Ill., assignor to Siemens & Halske Electric Company, Chicago; cylinder relief valve, Alexander Spencer, London, England; steam separator, W. W. Wray, Detroit, Mich.; air compressor, Ebenezer Hill, South Norwalk, Conn.; compound engine, Iowa Iron Works Company, Dubuque, Ia.: pumping engine, Herman Nielson, South Brooklyn, N. Y.; shaft couplings, Samuel Diescher, Pittsburg, (4): heating furnace, V. Edwards, Worcester, Mass.; assignor to the Morgan Construction Company, same place: conveyor for metal bars or rods, same, assignor to same, feeding mechanism for billet-heating furnaces, V. E. Edwards and E. H. Carroll, Worcester, Mass.: steam trap, N. H. Haigh and Thomas Sugden, East Dulwich, England: marine engine governor, John Levey and Thomas Sadler, Lindsay, Canada; hydro carbon oil engine. D. A. Briggs, Evart, Mich.; apparatus for manufacturing charcoal, C. J. T. Burcey, Syracuse, N. Y.; safety device for blasting purposes, J. M. Doyle, Denver, Colo.; machine for making fruit jars or bottles, W. P. Fisher and H. P. Ludington, Muncie, Ind.: mechanical stoker, William Frasser, Blackpool, England: apparatus for the manufacture of coke, Paul Naef, New York.

DETERMINING TEMPERATURE OF EXHAUST GASES.

BY R. H. FERNALD, New York; Associate Member Society Mechanical Engineers. Presented at the Boston Meeting.

IN preparing detailed specifications and instructions for conducting tests of gas engines (paper No. 0933 presented before this society at this meeting) the attention of the writer was directed to the necessity of an accurate and inexpensive method of determining the temperatures of exhaust gases. This problem had apparently received little attention, at least not sufficient to develop any simple means of making accurate determinations. In cases in which the results seemed to be reasonable, the apparatus used was far too expensive or too delicate for ordinary conditions, and efforts were at once centered upon the desired solution.

In the books at hand on engine tests, no mention is made of any method, and even in the very recent report of the committee appointed by this society "To Codify and Standardize the Methods of Making Engine Tests," the committee says (paragraph XX.): "The computation of temperatures corresponding to various points in the indicator diagram is, at best, approximate. It is possible only when the temperature of one point is known or assumed, or when the amount of air entering the cylinder along with the charge of gas or oil, and the temperature of the exhaust gases are determined." In the fine-print detailed instructions under the same paragraph the report states, "T may be taken as the temperature of the exhaust gases leaving the engine, provided the engine is not of the 'scavenging type.'

Fig. 1.

Fig. 2.

Again, in referring to the value represented by T in formula B of the same paragraph is found the expression. "If T be the observed temperature of the exhaust gases."

While references thus made indicate the necessity of obtaining these temperatures, yet nowhere in the report is there any suggestion of a method of making these determinations. Even if pyrometers and thermometers are regarded as sufficiently accurate, yet no measurements made at or near the muffler can give the true temperature of the exhaust gases unless proper corrections be made for the fluctuations in pressure. This at first appears to present little difficulty, but more careful thought shows the fallacy of the first impression.

Consider for a moment the action taking place at the opening of the exhaust. Although the gases in the cylinder have undergone rapid expansion after explosion, yet the expansion is far from complete, and at the point of release the pressure is still relatively high.

At the instant the exhuast opens there is an outrush of gases at this high pressure and correspondingly high temperature. Then follows, upon the forward stroke of the engine, a flow of a large mass of gases through the exhaust port, at a pressure little above that of the atmosphere and at a temperature necessarily less than that of the first discharge. In order to make the succession of events more apparent an indicator was attached directly to the exhaust pipe, and the cards obtained verified the statements just made in regard to the action taking place within the pipe. The diagrams represent the same conditions, the spring used for one test being only one-half as heavy as that used in Fig. 3.

There is, as it were, a mixture of pressures in the exhaust pipe and muffler, and also a corresponding mixture of temperatures, which must rapidly adjust themselves to an equilibrium of pressures and of temperatures.

Temperatures determined at the muffler are, therefore, not the temperatures corresponding to the pressure at exhaust, but those correpsonding to a much lower pressure, which is not determined. This accounts, no doubt, for the very low values of exhaust temperatures which have been reported even by recognized authorities upon gas engine problems.

The problem, therefore, resolves itself into the determination of the temperatures of the exhaust at some known pressure.

As a matter of simplicity atmospheric pressure was the natural selection, and a method was at once sought for reducing the exhaust gases to atmospheric pressure without losing any of the heat to which they are entitled.

It was at once decided that a receiver, of a form to be determined, should be placed close to the exhaust outlet of the engine, and some means devised for admitting the exhaust gases and allowing their pressure to fall to that of the atmosphere. The desired temperature could then be ascertained.

What the form of the receiver should be was not at first apparent, and, as practically no information could be found bearing upon the subject, the problem was reduced to one of experiment.

The first steps in the development were necessarily very crude and the results were of value only as furnishing a basis upon which to judge future determinations, and as such were of great value.

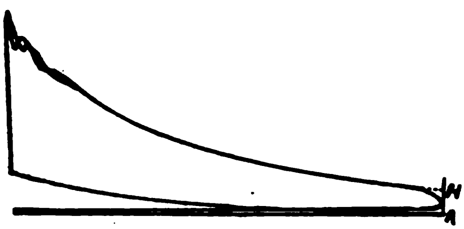

Fig. 3.

Fig. 4.

The first experiments were conducted as follows: Two cylinders of sheet iron were made, one 10 inches in diameter and the other 14. They were 16 inches high. The 10-inch cylinder, after being generously perforated near the bottom, was placed inside the 14-inch cylinder, the latter having several deep notches cut out at the top. A cover of the same material, and 15 inches in diameter was made, with the central hole about two and one-half inches in diameter, through which the exhaust pipe from the engine could be passed. A T was placed as close to the exhaust outlet of the engine as possible, and from it one line of pipe was run directly to the exhaust muffler, as usual, and the other line brought out horizontally and at right angles to the first, and then directed downwards to the receiver just described, the end of the pipe projecting about two inches through the cover, into the inside cylinder.

Valves were inserted in both pipes, so that the passage of the gases to the receiver or to the muffler or to both at once could be regulated at will.

In the receiver the gases were passed downwards through the inside cylinder out through the perforations and upward between the two cylinders, finally passing out through the notches in the top of the outside cylinder. The object of this arrangement was to prevent any direct draught or chimney action, which would cause an inrush of cold air at the bottom as soon as the inlet valve was closed. Two holes large enough to receive the thermometers were punched in the cover, one midway between the center and the inner wall and the other about one-half inch from the inner wall. There was no expectation that temperatures even approaching correctness could be obtained by this arrangement, but such a preliminary step was essential in order to have values with which future results could be compared.

The exhaust is directed to the receiver, and after being allowed to flow until the cold air in the receiver was entirely expelled, was shut off and the thermometer quickly inserted. The gases were now held in the receiver at atmospheric pressure. The pressure before closing the inlet was much greater, but dropped almost instantly to that of the atmosphere when the valve was closed. The difference in the readings of the two thermometers, one near the wall of the cylinder and the other about two inches from the wall, was not sufficiently marked to be of importance. The temperatures observed were:

370 degrees Fahr.	394 degrees Fahr.	398 degrees Fahr.
395 degrees Fahr.	372 degrees Fahr.	400 degrees Fahr.
	370 degrees Fahr.	

Various problems were now to be considered. Radiation and conduction from the cylinder to the outside air might be so rapid as to vitiate the results. The thermometers might be affected by radiation from the inside walls. Radiation from the iron exhaust pipe, which projected into the cylinder, might make the readings too high. Longer runs might tend to cause the cylinders to store up heat.

Many such difficulties had to be considered, and, no data being found bearing directly upon the subject, the experiments were continued.

An asbestos lining was now placed in the outside cylinder, and the temperatures obtained were:

474 degrees Fahr.	511 degrees Fahr.	525 degrees Fahr.
540 degrees Fahr.	552 degrees Fahr.	517 degrees Fahr.

Fig. 5.

Evidently the gases were retained at a much higher temperature than before, but were these higher temperatures due to excessive storing up of heat, or simply to the prevention of excessive radiation? A similar lining was also placed in the inside cylinder and the temperatures immediately shot up to over 600 degrees Fahr., which were unquestionably far too high. In all of the above experiments radiation through the cover was prevented by an asbestos lining.

After considering cylinders of various materials, a clay fire flue 10 inches in diameter was secured and used in place of the inner iron cylinder, the outside iron cylinder with its asbestos lining being retained. The temperatures now recorded were:

360 degrees Fahr.	484 degrees Fahr.	585 degrees Fahr.
388 degrees Fahr.	498 degrees Fahr.	560 degrees Fahr.
405 degrees Fahr.	512 degrees Fahr.	564 degrees Fahr.
442 degrees Fahr.	541 degrees Fahr.	554 degrees Fahr.
465 degrees Fahr.	552 degrees Fahr.	569 degrees Fahr.
469 degrees Fahr.	554 degrees Fahr.	576 degrees Fahr.
	567 degrees Fahr.	

These figures seemed to indicate a gradual storing of heat from the first to about 560 degrees Fahr., when the readings became more constant, but not sufficiently so to warrant the conclusion that the apparatus was nearly correct.

The conclusions at once reached were that the volume for the gases was too small and the thermometers too near the walls. The absorbing of heat by the receiver must also be prevented. In studying this problem it was seen to be undesirable to allow the gases to enter the receiver at such high pressures and temperatures, and that it would be of great advantage to admit the gases at a pressure and temperature little above those desired at the time of reading the thermometers. This would do away to a large extent with the tendency of the receiver walls to store up heat, as at no time would they be excessively heated.

The proper throttling was secured by the device shown in the illustration. It consists of a two-inch T with a plug in the top, through which passes one-half inch bolt, and a nipple and cap in the bottom; the bolt is supported by a helical spring, and in turn supports at the bottom a flat iron disk which rests against the two-inch cap the bottom of the cap being freely perforated.

Throttling Device.

By screwing down the nut at the top, against the spring, any desired resistance to the passage of the gases can be obtained, and at the same time any tendency to wire-drawing is obviated, as would not be the case if the throttling were done by means of the valve in the pipe alone.

Before experimenting to any extent with this device for reducing the pressure, a new clay fire flue, 18 inches in internal diameter, with cover of the same material, was obtained. In order so far as possible to prevent any radiation to the thermometer from the iron pipe delivering the gases to the receiver, the lower end of the device was allowed to pass barely through the cover, extending not over an inch below the inner face.

The bottom of the receiver was notched in several places to allow free passage of the gases from within. The gases were thus received at the top, passing downwards and out at the bottom. A rubber band three inches wide was bound about the bottom of the receiver, thus acting as a flap valve, the pressure of the gases entering the pot forcing the band outward, but the falling of the band preventing any inrush of cold air when the admission of the exhaust to the receiver was stopped.

Many series of experiments have been carried on by means of this device, with most satisfactory results. With the feed so adjusted that the exhaust entered the receiver at a pressure but little above that of the atmosphere, the storing of heat in the walls was practically prevented.

In case the exhaust was delivered to the receiver for an hour or more without ceasing there was a slight rise in temperature but as in practice the exhaust is cut off about every 10 minutes no difficulty is experienced from this cause.

The pressure under which the exhaust enters the receiver does not have to be closely regulated, as a slight difference does not affect the resulting temperatures, when taken at atmospheric pressure.

Especially satisfactory results have been obtained when the pressure was so regulated that the temperature of the gases in the receiver, while under pressure, was between 50 degrees and 100 degrees above the temperature at atmospheric pressure.

One or two preliminary tests will quickly determine what this temperature should be. The temperatures recorded from the new receiver did not range from 400 degrees Fahr. to over 600 degrees Fahr. but were:

200 degrees Fahr.	202 degrees Fahr.	203 degrees Fahr.
195 degrees Fahr.	201 degrees Fahr.	200 degrees Fahr.
195 degrees Fahr.	203 degrees Fahr.	200 degrees Fahr.
	203 degrees Fahr.	

The radiation from the receiver was not large. The walls were one inch thick and the hand could at all times be held on the outside.

Any change in the conditions tending to change the temperatures of the exhaust is quickly noticed by a corresponding change within the receiver. For example, if the point of ignition be changed, a corresponding change in temperatures is immediately observed. With the point of ignition as shown by the diagram, Fig. 2, the following temperatures were recorded:

199 degrees Fahr.	197 degrees Fahr.	197 degrees Fahr.
198 degrees Fahr.	196 degrees Fahr.	198 degrees Fahr.
198 degrees Fahr.	196 degrees Fahr.	198 degrees Fahr.
	199 degrees Fahr.	

With the ignition retarded as shown by Fig. 3, the temperatures were:

210 degrees Fahr.	210 degrees Fahr.	207 degrees Fahr.
216 degrees Fahr.	212 degrees Fahr.	212 degrees Fahr.
214 degrees Fahr.	211 degrees Fahr.	209 degrees Fahr.
	210 degrees Fahr.	

While making this particular series of experiments on points of ignition, the engine became stalled when set for a certain point of ignition and refused to run. The igniter was removed and found to be badly burned. It was adjusted for sharper contact and a new series of readings taken.

An immediate drop of about 50 degrees in the temperature resulted, showing at once the quick response of the receiver to changed conditions. The spark was now sharp and short, while previously the condition of the sparker was such that it was "holding fire."

The new series on the variation of the point of ignition resulted as follows, the temperatures in each column corresponding to the point of ignition shown in the diagram having the same number as the column of temperatures:

For Fig. 3	For Fig. 4	For Fig 5.
151 degrees Fahr.	166 degrees Fahr.	172 degrees Fahr.
149 degrees Fahr.	168 degrees Fahr.	176 degrees Fahr.
151 degrees Fahr.	168 degrees Fahr.	178 degrees Fahr.
152 degrees Fahr.	167 degrees Fahr.	175 degrees Fahr.
152 degrees Fahr.	167 degrees Fahr.	178 degrees Fahr.

Owing to the size of the receiver and to the necessity of having other connections made to the engine, the exhaust pipe leading to the receiver was longer than desired, having a drop of about one foot and a horizontal length of seven inches. The question of the necessity of covering the pipe, to prevent excessive radiation in conducting the hot gases to the receiver, was quickly settled by the following temperatures obtained.

Covered.	Covered	Not Covered.	Not C overed.
155 degrees Fahr.	158 degrees Fahr.	160 degrees Fahr.	156 degrees Fahr.
155 degrees Fahr.	158 degrees Fahr.	158 degrees Fahr.	157 degrees Fahr.
154 degrees Fahr.	158 degrees Fahr.	158 degrees Fahr.	156 degrees Fahr.
156 degrees Fahr.	160 degrees Fahr.	155 degrees Fahr.	157 degrees Fahr.

Having become satisfied that the apparatus as outlined was working with a reasonable dergee of accuracy, the next step was to devise receiver which can be erected quickly and cheaply, as it is not always convenient to procure a fire flue of the right size. Accordingly, a receiver was built of ordinary brick laid together closely, the inside layer being laid on the face and breaking joints, the outside larger being laid on edge, thus breaking joints both vertically and horizontally with the inner layer. While the cracks furnished sufficient passages to prevent any over charging of the receiver, yet the breaking of the joints prevented direct draughts, or inrush of cold air. As first constructed, the volume of the new receiver was made equal to that of the 18-inch fire flue previously used, and the fire flue cover was fitted to the new receiver. The results were highly satisfactory the temperatures being the same as before.

The interior was then partially filled with brick until the volume was reduced from 16x16x23 to 16x16x13, and again tested, with the same results.

In all of these tests with the two larger receivers the thermometer bulbs were kept about four to seven inches away from the walls and from the entering pipe. In the last receiver, when partially filled with brick, the thermometer bulbs were placed about the same distance from the cover in deep bottom.

It seems unnecessary, therefore, to have excessive volume, but there must be sufficient space so that the thermometer bulbs shall not be too near the retaining walls. Experiment indicates that the figures suggested for these distances are about right.

During the test the valve leading to the muffler in the main exhaust is kept wide open, unless the exhaust pipe is larger than is needed for the quantity of exhaust, and the valve in the pipe leading to the receiver is opened as desired. It is necessary to expel fully the cold air in the receiver before any readings can be taken.

With the larger receiver and an eight horse power engine this required about 20 minutes. The time can be much reduced when desired, by careful manipulation of the valves after one becomes familiar with the apparatus.

It is of great value to keep suspended within the receiver at all times a thermometer of sufficient range not to be broken by accidental increase of temperature. In the initial warming of the receiver this thermometer will readily show when the temperature has become constant. It also serves as a very efficient guide in adjusting the pressure as controlled by the inlet. For most of the readings taken the pressure was so regulated that this permanent thermometer recorded, while the gases were still under pressure, temperatures from 50 degrees to 70 degrees Fahr. higher than the final temperatures at atmospheric pressure.

The clay cover not being obtainable in all cases, gave way to one made of two-inch plank, chinked with cotton waste, and this has proved entirely satisfactory.

Previous methods of measuring the temperatures of the exhaust have in most cases furnished results which were surprisingly low, and not until Professor Robertson's paper on "An Efficiency Test of a 125 horse power Gas Engine" (Vol. XXI. Transactions A. S. M. E., p.396), has the writer seen a series of temperatures for the exhaust, which seemed reasonably accurate. Professor Robertson secured by means of a copper ball calorimeter values above 1,000 degrees Fahr., and in one instance records 1,209 degrees Fahr., occasioning this remark by Professor Thurston: "The possibilities of still further thermodynamic gain are indicated by the temperature of the exhaust gases, above 1,000 degrees Fahr,. and far above that of the prime steam of our steam engines."

In Professor Robertson's second paper upon the same subject (Transactions, Vol. XXII., p. 612) he reports temperatures of the exhaust, as found by a La Chatelier pyrometer, ranging from 1,410 degrees Fahr. to 1,805 degrees Fahr., and states: "These temperatures appear to be rather high—so high in fact that the author has examined other data at hand to see if any confirmation of the above figures could be found."

It is the opinon of the writer that the last figures quoted by Professor Robertson are not far from correct for the engine tested, but the pyrometer used is far too expensive and requires too much special apparatus, as well as special calibration, to make its use possible in most tests.

It takes but a moment's consideration of the problem to show that very little if any thermodynamic gain is possible by any attepmted reduction of the temperatures of exhaust, in the average gas engine of good modern design, unless accompanied by a reduction of the terminal pressure as shown by the expansion curve

With terminal pressures ranging near 50 pounds it is quickly shown that the exhaust temperatures must of necessity be much higher than generally recorded. Suppose, for example that the expansion line of the card shown in Fig. 3 be continued to full cylinder volume, as shown by the point H.

The pressure at H is found to be 50 pounds absolute. Suppose the temperature of the mixture in the cylinder, composed of air and gas, taken in during the suction stroke and mixed with the neutral gases filling the clearance space, to be only as high as that of the room, say 70 degrees, or 529 degrees Fahr. absolute at the point A, Fig 3.

Since the volume at H is the same as that at A, the absolute temperatures will be proportioned to the absolute pressures, or if

T_a=absolute temperature at A= 529 degrees.

P_a=absolute pressure at A=14.7 pounds.

P_h=absolute pressure at H=50 pounds,

then Th, the absolute temperature corresponding to the pressure at H will be derived from

$$T_h = T_a \frac{P_h}{P_a};\ T_h = 529\ 50\text{-}14.7 = 1{,}800$$

degrees absolute or 1,341 degrees Fahr. with the temperature of the mixture taken at 70 degrees Fahr. only. Actually the temperature of the mixture is much higher than this, and by means of the new apparatus described in this paper this temperature is readily deduced. The temperature secured at atmospheric pressure by means of the exhaust receiver is the temperature of the neutral gases that fill the clearance space of the cylinder.

MAGNETIC PROPERTIES OF IRON.

SOME time ago the Reichsanstalt made some magnetic tests of some new irons and steels, comprising Bohler tungsten steel and a tungsten steel from Remscheid. The tests were conducted by F. Gumlich and Erick Schmidt, partly on the magnetometric method with ellipsoids, and partly on the ballistic method in the yoke, with cylindrical rods from 6 to 10 centimeters in diameter; several dynamo sheet irons, mostly 0.5 millimeters in thickness, were also examined. Some of the yoke results were checked with the aid of the magnetometer. The materials were, as a rule, annealed within a china tube glazed outside only, contained in a tube of fire-clay, heated in a furnace of the Royal Porcelain manufacture. The temperature was raised to 950 degrees Cent., and the materials remained altogether three days in the furnace, including the period of cooling. To minimize oxidation, about one foot of rolled-up iron gauze, containing iron turnings, was placed in front of the specimen, and the one open end of the china tube closed by means of a cork stopper. The results obtained are briefly the following. A very pure, high-class iron from a mill was, after annealing, magnetically about as perfect as before; various cast-irons improved by one annealing, and deteriorated slightly on repeating this process. The coercitive force decreased to one-third, the hysteresis loss to less than one-half, the remanence (maximum residual magnetism) rose by 10 per cent, and the induction, in one case, by six per cent; in other specimens an increase in the induction was not observed. The diameters of these cast-iron rods increased by one per cent, and again by 0.5 per cent on annealing, and all the carbon in the iron was converted into graphite. As regards cast steel, the individual properties of the various specimens may almost mask the general character. One specimen of unknown history was decidedly worse after annealing. All the others improved magnetically, the coercitive force and the hysteresis losses were diminished, and the maximum permeability raised; two or three annealings answered best. Dynamo steel sheets, which had been already annealed in the works, behaved somewhat differently. The annealing was generally advantageous; a repetition of the process was not. Removing the oxide skin by means of acid and emery paper had a bad effect—probably of a mechanical nature, and it is altogether doubtful, considering this great mechanical sensitiveness, whether the magnetic testing really tells us much about the properties which the sheet material will have in the finished dynamo. Rods did not suffer from mechanical treatment; but even in rods of three centimeters thickness, the three days' annealing did not penetrate right through to the core. The electric conductivity tests to which the rods were submitted are almost novel. We cannot quite stop Foucault currents by laminating the iron; and since these currents will be greater the higher the electric conductivity, we ought to aim at combining small hysteresis losses with high electric resistance. No distinct correlation was noticeable between the different properties, but the averages compiled by the authors show a promising relationship. With an increase in the hysteresis losses from 10,000 to 24,380 ergs, the residual magnetism increased from 8,360 to 10,740, the coercitive force from 1.1 to 3.4, and the electric resistance, calculated per meter length of one square millimeter section, from 0.147 to 0.190, while the maximum permeability diminished from 4,120 to 1,560. For some specimens this proportionality does not apply, however. Noteworthy is a magnetically excellent material (composition not disclosed, the information being confidential) whose electric resistance, proved three times as high as the average resistance, and higher than that of hardened steels. On the whole, the relaton umax =a R c seems to hold where a=a+B c, with an average value where a=0.5. R is the remanence,c the coercitive force, and these terms are determined in the following manner. The specimen is magnetized and passed through several cycles; the magnetizing current is then diminshed to zero, very gradually in small steps; the remaining magnetometer reading gives the remanence. The current direction is now reversed, and the current slowly increased until the magneto meter has returned to zero: from this latter observation the coercitive force is deducted. No such law had so far been established.

HIGHSPEED TOOL STEELS.

AMONG the most interesting features of the Paris exhibition was the demonstration made by the Bethlehem Steel Company of the remarkable properties of tool steel treated by the Taylor-White process. Tools prepared by this process were shown at work, turning up mild steel at a cutting speed of 140 feet per minute. The steel used in the tools in question was of the self-hardening type, and the method of treatment consisted essentially in heating it to much higher temperature than was at all usual with such steels, and then cooling it rapidly. As a consequence of the display at Paris, the "Berliner Bezirksverein Deutscher Ingenieure" undertook a series of investigations, from which it appears that many of the ordinary self-hardening steels, not specially treated, also exhibited the property of maintaining their edge when heated to quite high temperature, and might therefore be justly considered as high-speed tool steels. These researches led manufacturers of such steels to endeavor to still further enhance this special property by suitably proportioning the constituents of the alloy, and as a result it is claimed that self-hardening steels are now on the market which in every respect can be compared with the very best results attained by the Taylor-White and similar methods of treatment. In a paper published in a recent issue of Stahl und Eisen, Otto Mulacek, chief engineer of the Poldihutte, Kladno, claims this position for the Extra Diamant 000* steel produced at his factory. The property of maintaining the temper when heated, which is possessed by such steels, he attributes to the presence of chromium and tungsten, which, like iron, are capable of forming carbides. In the unhardened state the steel contains only carbide of iron, but at a certain definited temperature this carbide decomposes, and carbides of chromium and tungsten are formed instead, and are fixed by rapid cooling. These carbides are stable at much higher temperatures than is iron carbide. The Extra Diamant steel, above referred to, is stated to be more easily smithed than ordinary tool steel, since the range of temperature from which it can be quenched without material difference in the results attained lies between 1,100 degrees and 1,250 degrees Cent., which is a wide range as compared with that admissible with ordinary tool steels. To get the best results, however, it is important that the tool used should be ground to definite angles, the most suitable of which have been selected as the result of an extensive series of experiments. Any large departure from those thus chosen greatly increases the amount of heat generated and may cause the tool to lose its edge.

Thermometers—A. Kuhn (Abstract in Chem. Trade Jour. No. 783 from Chem Ziet.) The best thermometers are now more expensive as precautions have to be taken in making them which were formerly disregarded or quite unknown. The tubes must be tested for uniformity of bore. A certain percentage have to be rejected, the remainder are classified and the best used for standard thermometers. The error of calibration of these must not exceed 0.25 degrees C. The best glass for the tubes is Jena normal glass 16III. The only other that approaches it is Greiner and Friedrichs' "Resistenz" glass. Instruments made of other glass, when heated to 360 degrees C., are liable to alter their zero point four to five degrees. The tube must be kept sometime in order that it may have constant zero point. This time may be reduced by keeping the thermometer at a low temperature. The mercury used must be pure and it is generally purified by Fuess's method. Formerly dozens were filled at once, now each tube is filled separately and boiled over a gas or spirit flame. Thermometers for use above 250 degrees C. are filled with nitrogen under 20 atmospheres pressure. When for special purposes in factory or laboratory, they must be standardized to give correct readings under the actual conditions of use.

DETAILS OF DIRECT CONNECTED GENERATOR SETS.

BY WILLIAM H. BRYAN, St. Louis, Mo. Presented at the Boston meeting of the Am. Soc. of Mech. Eng.

THE results of a recent investigation into some details of the design and construction of steam-driven connected generators, may be of interest. The inquiry covered:

First. The procedure usually followed between the builder of the generator and the builder of the engine in reaching an understanding regarding the detailed design of shaft and bearings.

Second. The method of construction and final erection preferred.

Third. The advantages and disadvantages of a shaft coupled by flanges, as compared with a continuous shaft.

Correspondence regarding these points was conducted with a number of the leading engine and generator builders, and was supplemented by personal interviews as opportunity offered.

There seemed to be a practically unanimous agreement to follow the general design and dimensions recommended by the society's committee on standardization of engines and dynamos, in its final report at the New York meeting, December 1901. Pending the adoption of these rules, however, or where for any reason the case seems to demand special consideration, the following procedure is usually followed:

On receipt of the order at the works of the generator builder, a certified dimension print is prepared, giving the data which the engine man needs to design his shaft. This drawing shows:

A. The limit lines beyond which the engine parts must not extend.

B. The form which the shaft should have within the armature spider.

C. The weights of revolving parts.

D. The unbalanced magnetic pull for 1-32 inch displacement which might result from the armature getting a little out of center, by the wearing of bearings or otherwise.

Usually the diameter of the shaft is left wholly to the engine builder, after putting him in possession of the data necessary to design the same intelligently. The custom is now almost universal of supporting the brush holder rigging on the generator frame, so that the engine builder is relieved of any responsibility on that account. As a rule, also, the engine builder furnishes the extended base, outboard bearing, holding down bolts, and shaft keys.

The unbalanced magnetic pull (paragraph D above) is of decided importance, and its possible effect must not be overlooked. This pull may, of course, be in any direction in the plane of revolution, and it varies as the square of the displacement. It must be considered in determining shaft dimensions and bearings, as it may occur in a vertical plane, and thus have the same effect as additional weight of armature. It may also occur in a horizontal plane, and must, therefore, be considered in designing the bed plate and foundation bolts.

Usually the generator builder makes his armature hub sufficiently thick to provide for considerable variation in the diameter of the shaft, as may be required by different engine builders. If for any reason the generator builder has already fixed the bore of the armature the engine builder is expected to meet that condition. If he cannot readily do so, the matter is one which must be taken up further for adjustment, or settled by the purchaser or his engineer.

On receipt of the above data, the engine builder is supposed to proceed at once with the design of a shaft suitable for the intended work. When completed, his drawings are forwarded to the generator contractor for checking and approval. On receipt of approved drawings the engine builder proceeds with the construction of the shaft.

As soon as possible after receipt of the shaft dimensions from the engine builder, the contractor for the generator prepares a pin gauge giving the exact dimensions of

the bore of the armature hub. There is a general acquiescence in the recommendation of the society's committee that the engine builder make the necessary allowance for the press fit. A few builders, however, advise that the general contractor provide the allowance when taking the gauge, so that it will show the actual diameter to which the finished shaft is to be turned. In justification of this position they claim that the allowance depends far more on the material of the armature and the design of the hub, than it does on the shaft. In most cases the allowances recommended by the society's committee for shrink fit are considered ample, although one prominent generator builder thinks the allowance should be doubled.

Sometimes there is a departure from the above plan of procedure to the extent that the one whose work is furthest advanced makes the pin gauge, and sends it to the other, who governs himself accordingly.

Although all generator builders claim, in advance of award of the contract, that they are prepared to furnish generator data to the engine builder almost immediately on receipt of order, there is almost invariably a serious delay in reaching an agreement between the two contractors. This loss of time is sometimes due to the necessary "red tape" through which an order must pass before it reaches the construction department. Sometimes it is claimed to be due to delays in the mails. Sometimes the data is withheld pending the execution of the formal contract by the proper officials. These delays are often serious when the work is of the "rush" order, and it seems that an effort in good faith should be made to avoid them. Is there any good reason why full data on standard machines—even including shaft gauges—should not be kept on hand at the district offices for immediate delivery to the engine builder on award of contract? It has even been suggested that bidders on generators be required to file with their proposals the necessary shaft data. This would save much vexatious delay. It is, of course, presumed that the speed of rotation has been decided upon and agreed to by both parties when the contracts are closed.

When the engine contractor returns his drawings of shaft to the generator builder the following information is supposed to be given:

E. Direction of rotation—whether clockwise or opposite—when looking at the commutator end of the machine.

F. Location of generator with reference to engine, whether commutator is on the right or left of generator when standing at cylinder end facing shaft.

G. Further details, such as whether there are one or more cranks, whether they are solid forged or forced on, height of center of shaft above floor, diameter of shaft location of armature and fly-wheel in relation to bearings, dimensions and weight of fly-wheel, length of hub and cross section of rim.

Some difference of opinion exists as to the best method and place of erecting the armature on the engine shaft. The ordinary practice for small and medium sized units is for the engine contractor to place the shaft in final position where the unit is to be used, after which the generator contractor presses on the armature, and completes the adjustment of the electrical machine ready for service. This necessarily involves some extra expense when the point of erection is at some distance from the builders' shops, or where they have no local erecting gang. Furthermore, the work is always more expensive, and can never be as satisfactorily or as quickly done, as in the shops of one or the other of the builders. There is a widespread sentiment, therefore, that either the generator contractor should send his armature to the engine shops where it can be placed in the shaft by the engine builder; or that the shaft itself—in whole or in part—be shipped to the generator builder for the armature to be pressed on, the latter arrangement seeming the preferable one. This plan possesses, many advantages, but is open to the criticism that extra freight charges are incurred, and delays invited.

The relative location of the two shops with reference to the point of final use would seem to be a factor in determining which shop should press the armature on. For a set destined for erection in St. Louis, for instance, the engines being built at Springfield, Ill., and the generators at Schenectady, N. Y., it would not be justifiable to ship the engine shaft to Schenectady, and return. The fact that as soon as the armature is attached to the shaft the whole becomes electrical apparatus, and takes

a higher freight classification, has a bearing on the subject; also that there is an increased freight cost in dividing shipments instead of concentrating them. The contracts should state definitely who is to pay the increased freight charges.

Trouble often results from the erection of the armature on the engine shaft at a distance from the shop, where competent men and suitable facilities are not always to be had. This is particularly the case with center crank engines, where the crank pin may be sprung, unless a piece is fitted between the jaws of the crank before the pressure is put on.

Several prominent builders recommend mounting the armatures on conical collars instead of the usual press fit. This is claimed to lessen the time of erection, obviate the chances of springing the shaft, and remove all danger of misfit. Furthermore, if the owner ever desires to remove the armature, it becomes a simple and inexpensive matter. On the other hand it is claimed by many large builders that the press fit is more rigid, distributes the strains better, is less expensive, and, everything considered, is superior.

For many years I have specified that the engine shaft carrying the armature should be continuous, and not coupled by flanges or otherwise. This arrangement seemed to have the approval of the best engineers and builders on account of its superior rigidity and reliability, as well as the space required on the shaft. It is still preferred by most of the largest generator builders, although many of them do not object particularly to the coupled construction. Sometimes the use of the solid construction involves delay in getting the necessary forgings, as well as extra cost, if it is a rush order. Ordinarily, however, the coupled construction is the more expensive one, but some time may be saved by its use. I was surprised to find a large and growing sentiment among builders of center crank engines in favor of the coupled form of shaft, the argument being substantially as follows:

The armature shaft being a short and simple structure could readily be sent to the generator shops for the armature to be pressed on, freight and boxing both being less. Time could always be saved, as it would only be necessary to fit the shaft, adjust it centrally in the outer bearing, then box and ship it, the main shaft being retained to complete the work of balancing, polishing, etc. There will be no danger of springing the shaft, as explained above. Earlier delivery of the complete engine could usually be made, as the engine shafts would be made in quantities, and kept in stock. When time is short the engine builder could complete all his work, except the extended shaft, whereas there is often a delay if a continuous steel forging is necessary. The entire engine can be completed—and even tested—while waiting for the forging for the armature shaft, which on arrival can be finished up in a few days. Some builders are preparing to make up a stock of crank shafts with flanges finished solid on the end of the shaft ready to receive the flanged armature shaft, which will be specially constructed in each case to fit the generator selected. The saving in time and expense is obvious.

I have not been able to satisfy myself, however, that a coupled shaft is as desirable, everything considered, as the solid one, as the chances for inaccuracy and derangement appear greater. The increased space required is also often important, particularly in city plants. There is room for agrument on this point, however, and the hope for a full discussion is my principal incentive for presenting this paper.

Is the overload limit of 25 per cent recommended by the committee wise? Most generator builders now guarantee their standard machines to safely carry 50 per cent overload for one hour longer. Should not the engine have a similar margin? Often the peak of the load lasts but an hour or so, and it is better engineering to run at reduced efficiency for this short period or rather than to invest a greater amount in a unit which will be underloaded for the rest of the 24 hours. This can be accomplished by later cut-off, if the engine is structurally strong enough. Part might also be gained by running up the steam pressure a little, but this is not always permissible.

It is to be hoped that engine and generators builder will promptly carry out their agreement as to early compliance with the details established by the society's committee on standardization, and that there will result great shortening in the time now necessary to agree on shaft data. May the day speedily come, also, when an agreement may be reached as to standard sizes of alternating and railway generators.

NOTES FOR THE CHEMIST.

Blue Print and Black Print Photographic Papers—Alfred I. Cohn. (Jour. Soc. Chem. Ind. Vol. XXI. No. 9). The author describes the methods of manufacturing blue-print and other photographic papers since the time of their introduction by Sir John Herschel, in 1840. For ordinary blue-prints a solution containing 12.5 grams of green ferric ammonium citrate, 4.5 grams of potassium ferricyanide and 100 c. c. of water gives best results. (The ferricyanide should be washed with water to remove surface of crystals, which may be slightly decomposed by action of light.) The solution should be filtered and applied to the paper by gas-light, never by daylight. The green salt produces a much more sensitive paper than the ordinary ferric ammonium citrate, occuring in the well known form of brown scales.

For a positive or blue line print, the formula of Pizzighelli and Itterheim may be used. (1) Gum acacia, 20; water, 100. (2) Ferric ammonium citrate, 50; water, 100. (3) Solution of ferric chloride, 50; water, 100. Of these solutions, first mix 20 volumes of No. 1 with eight volumes of No. 2, and then add five volumes of No. 3. Mixed in any other way the solution will be useless. The mixture thickens to the consistency of soft butter. Allow to stand over night to "ripen" and use the next day.

Use a well sized paper and apply uniformly. Development is effected by applying a 20 per cent solution of potassium ferrocyanide with a brush, passed over the print in parallel strokes. The image comes out in pale blue lines on a greenish blue ground. Immerse print in very dilute sulphuric acid, in which the lines become deep blue and the ground pure white. Wash well to remove last traces of acid. Spots may be removed by dilute soda or potash solution. The finished prints are very handsome in appearance.

For black line prints, the paper is sensitized in a solution containing five per cent of sodium bichromate and 50 per cent of phosphoric acid. It is very sensitive and prints in one half to one minute in sun light. The prints are developed in an atmosphere of steam and the vapors from crude aniline, contained in a suitable cabinet. Wash well with water to remove all acid. The prints are handsome and very permanent.

Other processes are described and the author concludes the article with a description of two types of machines used in sensitizing paper in bulk.

Potassium Tetroxalate and Sodium Oxalate as Materials for Standardizing Acid Solutions—Dr. Dupre and A. von Kupffer (Ziet. angw .Chem). These substances have been recommended by Treadwell, but the authors find it difficult to prepare them so that they do not decompose when kept, and that it is practically impossible to obtain them so pure as to neutralize the theoretical percentage of acid. Different chemists are continually advocating the use of new substances for determining the titre of standard acids and alkalies, without sufficiently considering the necessary conditions which must be complied with in order to replace those at present in use. The substance which has found most general favor is sodium carbonate, prepared by heating pure bicarbonate. There is no doubt that if ordinary care is used a very high degree of accuracy may be achieved in this way. A standard solution may be prepared directly by weight or a standard acid titrated against the solution. It is, however, desirable to have an independent check, which shall be preferably an acid so that standard acid may be directly prepared or caustic alkali be standardized. A reliable and simple method has been worked out by A. Marshall (Jour. Soc. Chem. Ind. Vol. XXVIII, No. 4.) who dilutes pure sulphuric acid with half its volume of water, determines its specific gravity and then weighs out the quantity required. These two methods have been recommended by Sutton, (Volumetric Analysis p. 49). The possible error of either of them probably does not exceed one in 5,000 with ordinary care. The number of other methods of standardizing acid and alkali solutions that might be devised is practically unlimited, but they are not to be recommended unless they are equally as accurate and inexpensive as the two mentioned above and more convenient. (Abstract in Chemical Trade Journal).

Indirect Estimation of Alkalies in Water—W. W. Fisher (in The Analyst, May,

1902). In the analysis of waters where mineral constituents have to be estimated, the more abundant bases determined are the lime, magnesia, and soda (inclusive of potash), and the acid radicals are usually chlorine, sulphuric acid, carbonic acid, and possibly nitric acid. After such determinations have been made, it becomes a somewhat tedious task to calculate the quantities of the compounds present and much arithmetical work is involved in finding out whether the estimations duly balance each other. But this work of computation is greatly simplified if the relative molecular proportions of the several acids and bases are first obtained by dividing the quantities of each by their molecular weights, and taking the totals of acids and bases separately. If the work is absolutely correct, the totals will be alike, and they will always be near each other if the determinations are good, while any marked difference would indicate some analytical error, as only neutral compounds are present in the total solid residue. The following analysis will serve as an illustration:

Total solids, 79.24, at 100 degrees C. and 78.12 at 140 degrees C.

	Grains per gallon.		Molecular Weights.	Molecular Proportions.
Cl	9.70	÷	71	0.1366
SO^3	4.66	÷	80	0.0582
CO_2	21.56	÷	44	0-4900
Total acids				0.6848
Na_2O by difference	[40.12]	÷	62	[0.6473]
MgO	0.5	÷	40	0.0125
CaO	1.4	÷	56	0.0250
Total Bases				0.6848

	Molecules.				Grains.
2Na Cl	0,1366	×	117	=	15.98
Na_2SO_4	0.0582	×	142	=	8.26
Na_2CO_3	0.4525	×	106	=	47.96
Mg CO_3	0.0125	×	84	=	1.05
Ca CO_3	0.0250	×	100	=	2.50
Total salts					75.75
Silica					2.50
Fe_2O_3					0.84
Total Solids					79.09

The subsequent work of combining the acids and bases, apportioning to each its due quantity becomes very simple when the molecular proportions are used, as 0.1366 molecules of chlorine will require 0.1366 molecules of soda to form Na Cl (if nitric acid is present, calculate Na NO_3 next), then 0.0582 molcules of sulphuric anhydride will require 0.0582 molecules of soda to form Na_2SO_4 and the remaining soda, viz 0.4525 molecules will require an equal amount of carbonic acid, and so on until all the salts are obtained.

The direct estimation of soda in waters is a troublesome and lengthy operation and in technical analysis is frequently omitted. Yet a knowledge of the amount present is very desirable in order to allow the amount of salts to be approximately stated. It is impracticable to arrive at the amount of alkali by deducting the other constituents from the total solid residue because any residues rich in sulphates retain water in variable quantity according to the conditions of drying. But when the lime and magnesia are known and also chlorine, sulphuric and carbonic acids (and possibly nitric acid also) the difference between the molecular totals of acids and bases gives a close approximation to the amount of alkali.

In the anaysis quoted above the total acids being 0.6848 molecules, the bases shoud be the same, from which, if we deduct 0.0375 molecules of magnesia and lime, the remainder of 0.6473 is soda (and potash, if present). Multiplying 0.6473 by 62 we get 40.12 grains per gallon. This result may be controlled by the direct estimation of the total bases as sulphates. In another analysis quoted by the author the calculated soda was 52.99 and by direct determination 53.14. This first result is near enough to the actual amount to be used as a basis for the calculation of the salts present.

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EDITORIAL COMMENT.

A Situation of Interest—The control of values in iron and steel, the task set for itself by the United States Steel Corporation, as a problem had the strongest interest for the whole world when prices began to expand early in the year. Now that the situation presents different phases than at the beginning the problem has still greater interests for the consumers and the general spectator. The Steel Corporation has kept to its task assiduously as the officials announced would be the case, but even with its best endeavors prices have gone on advancing even in the case of the raw materials over which the Corporation had the greatest control. In the pig iron market the big concern was forced to buy at the prices made by the "little fellows" and there is no way to escape from a repetition of that buying. In practice all that the Steel Corporation has accomplished was to control the prices of the products of its own plants. All other values have gone beyond the implied limit of the earlier weeks of the year. Even the announcement that rail contracts are making at present for delivery during 1903 at the ruling quotation, $28 at mill, has not had the effect of staying other advances. Naturally the question arises, if the general consumers are willing to pay higher prices for prompt material why should not those concerns not controlled by the Steel Corporation get the best obtainable prices for their materials. The smaller producers cannot hope to compete with the Steel Corporation plants at times when there is not enough business to fully employ all the great steel mills. Naturally, too, if the smaller producers are ever to get strong prices it must be at a time and under conditions like the present—when there is more tonnage than the consolidated interests are able to care for promptly. Were the conditions reversed and the question one of making low prices to meet panic conditions there would not be the faintest hesitancy on the part of the Steel Corporation in making prices that would close all the plants in the country except those in the consolidation.

If the smaller producers and consumers are forcing the market to get material there may be some danger if enough material was moving at inflated values to frighten the market but that does not appear to be the case at present whatever the final results may prove to be.

In the Political Stage—The strike of the coal miners of the anthracite and bituminous districts has reached the political stage where it will be ended. That is its sphere and few were deceived at the beginning into the belief that the strike was for any other purpose than political benefit to some one, presumably the officials of the United Mine Workers. At the same time a part of the scheme of the strike was to prepare political trouble for men in public life and the most recent information appears to indicate that that part of the program is also working out with some degree of success. Politicians of national standing are displaying an interest in the strike situation that is foreign to their usual course. If the rank and file of the miners organized and unorganized, had a share of the political interest in the case that is shown by their leaders and the national politicians the situation would be different and undoubtedly would have an ending different from that proposed by the official leaders and their allies, the politicians.

In the meantime the blast furnaces which depend wholly or in part upon the supply of anthracite coal for their fuel are showing signs of severe suffering. With the addition of the bituminous miners to the list of idle men the situation promises to develop even greater severity but of that the politicians are not expected to take heed. Politics and the industries seem to bear no relation to each other except at quadrennial periods when the workers are informed by the stump spell binders how they may develop the industries by a judicious selection of political faith as exemplified by a ballot. But at all other times the workers are instructed just as strongly not to mix their politics and industrial prospects. When the period arrives and it will come some time, when the miners and all other day workers refuse to indulge in the costly idiocy of strikes the political tricksters will have more respect for them and more or less fear of the distribution of their favors.

PERSONAL MENTION.

At the annual meeting of the South Chicago Furnace Company, last week, R. F. Howe was elected a director in place of D. M. Cummings. Mr. Howe is of the Deering Harvester Company. Charles Deering of that company was formerly a director, but resigned some time ago. No change in the capitalizaton of the company was voted at the annual meeting. The company has plans for extensions which, however, have not been finally settled. The capital stock stands at $300,000, but the investment is much greater, probably $1,000,000.

Prof. Charles L. Griffin of the Pennsylvania State College has received the appointment of professor of mechanical engineering at the new college of applied science of Syracuse University. Professor Griffin is to be head of the department of mechanical engineering and will have several men associated with him at the start and more as the plan grows.

Edward Shearson, who recently resigned the position of comptroller of the United States Steel Corporation to become member of the new firm of Shearson, Hammill & Company, successor to Raymond, Pynchon & Company, New York, is succeeded in his old position by W. J. Filbert, heretofore assistant controller of the Corporation.

E. J. Blake, M. Am. Soc. C. E., consulting engineer of the Chicago, Burlington & Quincy Railway, and S. D. Purdy, roadmaster and division engineer, were killed in a wreck on that road at Alma, Wis., May 29. W. L. Breckinridge, chief engineer, and J. B. Besler, general superintendent, were seriously injured.

W. C. Allison has resigned his position as general manager of the Niles Car & Manufacturing Company, Niles, O. Mr. Allison retains his stock on the company and will remain a director. He resigned the position that he might give all of his attention to certain business interests.

E. F. Wood, who has been assistant superintendent of the Homestead Steel Works for the last 120 years has resigned that position, and accepted the more important place of vice president of the International Nickel Company, with headquarters in New York.

H. S. Waite, for some time past connected in the sales department of the Case Manufacturing Company, crane builders, Columbus, O., has been elected secretary of the company.

Charles Warren Hunt, secretary of the American Society of Civil Engineers, sailed with his family last week from New York for a visit of indefinite length in Scotland.

OBITUARY.

GEORGE W. BROWN—After an illness extending over a period of several months death came to George W. Brown, of the Case Manufacturing Company, June 6, at his home in Columbus, O. His death was caused by a stroke of paralysis, the second he had suffered within a month. He had been attending to his business affairs until about the first of the year when a sudden collapse occurred, and he was taken South for the purpose of getting complete rest. He had recovered sufficiently to allow his return to Columbus and it was hoped that he would again be at his desk in a few weeks.

Mr. Brown had been connected with the Case Manufacturing Company as vice president treasurer and general manager for some time and had placed the concern among the leading crane builders of the country by energetic and faithful attention to the business. He was widely known in the community in which he lived, having been connected with various institutions and enjoyed a wide acquaintance with a large number of manufacturers throughout the country.

Mr. Brown was born near Orrville, O., in 1854 and at the age of 12 years began his business career as an apprentice in a milling plant. He was afterward associated with several milling concerns in Cleveland and Brimingham and in 1897 returned to Columbus where he connected himself with the Case company. He leaves a wife and seven children.

Change of Firm Name.

The business of house moving and structural steel, formerly conducted by John Eichleay, Jr., has been discontinued under this style and will be conducted under the name of the John Eichleay, Jr., Company, a corporation, of which the former John Eichleay, Jr, is the senior member and president: John P. Eichleay, is vice president; Walter B. Eichleay secretary and treasurer.

The French-American Wire Company, Philadelphia, Pa., has been organized with $125,000 capital stock.

There is some talk of establishing a foundry plant at Bath, Pa. Burgess Miller has the undertaking of the location.

A New Coating Method.

Sherard Cowper H. Coles an electro-meta ur gist, of London, England, has discovered a process of depositing metals on metallic surfaces, and has obtained a patent in this country which has been purchased by the Sherardizing Syndicate, limited, of Westminster, London, England. The most successful results in depositing zinc on iron or steel have been achieved by dipping the metal to be coated in a bath of molten zinc, the "hot" galvanizing method, or depositing the zinc electrolytically, the "cold" galvanizing method.

By the new process, the thickness and evenness of the deposit can be regulated as desired and any shape of iron or steel can be satisfactorily and economically dealt with.

The surfaces of the articles to be coated are first cleansed by any well known process, such as pickling or by the sandblast, and placed in a receptacle of iron or steel, and covered with zinc dust. The air should be excluded as much as possible, and for this reason a closed receptacle is preferable. The box is submitted to the action of heat, about the dull-red heat of iron is sufficient, for half an hour to an hour, depending on the thickness of deposit required. The receptacle is allowed to cool and the articles withdrawn, when they will be found to have deposited on their surfaces a smooth tough adherent coating of zinc. The remainder of zinc-dust employed may be used again, and if the air has been excluded the loss of efficiency is very small. Under certain circumstances higher temperature may be used, in which case the deposit penetrates more deeply.

The deposit on the iron or steel can be formed of more or less thickness, according to the length of time during which the zinc-dust is allowed to act on it. If the zinc deposit so formed be removed by any mechanical means, such as filling or chipping, the surface of the iron exposed is still unaffected by corrosion.

On metallic surfaces covered with zinc according to this process the deposit of zinc is homogeneous and in this respect is different from hot galvanizing. In appearance it also differs from galvanized iron or steel, due to difference of structure, and the zinc deposit appears to be free from crystalline formation. Under the microscope enlarging to 50 diameters the difference between samples made according to this process and those made according to the ordinary galvanizing processes is marked in structure and formation. In the latter case the coating is distinctly crystalline and in the former it is apparently not so.

Addition to the Puddling Process.

Another improvement in the art of puddling iron has been devised by Robert A. Carter, of this city. A bottom is formed with cinder, as is the usual practice, and over the bottom and on the sides of the hearth, ore is spread and subjected to a sufficient heat to reduce it to a molten condition. This is allowed to cool and harden to prevent impurities from the cinder bottom coming in contact with the pig iron. When the bottom is prepared finely divided ore is spread over the bottom and the pig metal charged. The amount of ore applied at this time is equal or approximately equal to five per cent of the charge, but these proportions may be varied within wide limits. When the charge is brought to a boiling temperature the puddler will begin stirring to effect a mixture of the metal with the ore on the bottom. An addition of ore equal to about five per cent of the charge is added from time to time in small quantities, the stirring being continued until the metal comes to nature.

Instead of placing ore upon the ore bottom previous to charging, the whole quantity of ore may be added gradually and in small quantities after the metal begins to boil. By the addition of the ore, which should be low in phosphorus and sulphur, a dephosphorization, desulphurization, and decarburization of the pig metal is effected without the addition of the impurities incident in the use of scale, cinder, lime, etc., as has been the practice heretofore. The metal is balled, as usual.

When the cinder becomes thin by reason of the high temperature and the addition of ore and been separated from the metal by the stirring, it can be removed to any desired extent by tapping, either from the top or bottom. In addition to its purifying action the ore retards the reduction of the molten metal to nature, insuring greater working as it must be continuous until the metal is balled. A more thorough separation of cinder is also effected.

At a stock holders meeting of the Case Manufacturing Company, Columbus, O., held lately the following directors were elected; E. K. Stewart, James Watson, G. W. Brown, T. M. Livesay and H. S. Waite and at a later meeting of the directors they elected the following officers: James Watson, president G. W. Brown, vice-president and treasurer and H. S. Waite, secretary.

The Osborne Manufacturing Company, Cleveland, O., manufacturer and dealer in foundry equipments and supplies, will remove its offices and factory to 1331 Hamilton street, Cleveland.

The Value of Denials.

With a connected series of official denials still lingering in the air C. H. Halcomb went out, June 4, as president and director of the Crucible Steel Company of America, and in his place is Reuben Miller who about a month ago resigned as treasurer and director.

Mr. Halcomb retires as a member of the directorate, not only of the Crucible company, but also the St. Clair furnace, the St. Clair Steel and the St. Clair Limestone and other subsidiary concerns which are now being underwritten by the new Clairton Steel Company. The following list of officers was officially announced by the Crucible Company:

Reuben Miller, president; Frank B. Smith, assistant to the president, general manager and secretary; Benjamin Atha, first vice president; R. E. Jennings, second vice president; James H. Park, third vice president; Charles E. Clapp, fourth vice president and general sales agent; Julius Bieler, treasurer.

For the Clairton Steel Company the following list of executives was announced: William P. Snyder, president and member of the executive committee, with these associates; Benjamin Atha, R. E. Jennings, Andrew W. Mellon, Frank B. Smith, James H. Park and Reuben Miller.

The positions of general manager and assistant to the president has been tendered to Frank B. Smith, secretary of the company and a member of the directorate and of the executive committee of the new Railway Steel Spring Company of America, of the positions of assistant to the president and general manager, he at the same time to continue in his office as secretary.

Antimony Production in 1901.

Antimony is used chiefly for making alloys with lead, tin, zinc, and other metals. The most important alloys of antimony are type metal, composed of lead and antimony, with or without the addition of tin; hard lead, produced in refining antimonial lead, and containing generally about 25 per cent antimony; Britannia metal and pewter, used extensively for tableware; anti-friction metal, also called white metal and Babbitt metal. The principal salts of antimony are tartar emetic, used in medicine and in dyeing; antimony cinnabar, a fiery red colored pigment used in oil painting; and antimony pentasulphide, used as a red pigment for vulcanizing rubber.

The source of the supply of antimony for consumption in the United States, says Dr. Joseph Struthers in Mineral Resources of the United States, 1901, now in press, United States Geological Survey, David T. Day, Chief of Division, are the hard lead derived from smelting foreign and domestic lead ores; imported regulus or metal; imported antimony ores; and domestic ores. The aggregate amount of antimony available as metal or in alloy from these sources in 1901 is estimated at 8,971,844 pounds, valued at $919,614. The control of the antimony industry remains in the hands of Mathison & Company, of London, with works at Chelsea, Staten Island, N. Y., and of the affiliated concern, the Chapman Smelting Company, with works at San Francisco. The estimated consumption of antimony in 1901 was 4,486 short tons. The imports in 1901 were valued at $279,602, as compared with $363,803, in 1900, when there was an over-importation of both ore and metal. There was an export in 1901 of 49,655 pounds of antimony ore, valued at $1,536.

Some Recent Exports.

About 3,000 tons of iron pipe were exported last month via Eastern ports by the National Tube Company from its McKeesport plant, being an increase of nearly 50 per cent as compared with that concern's exports during April.

Europe was the most important purchaser, 2,015 tons having been shipped to that part of the world, Antwerp alone taking five consignments, representing an aggregate of 1,583 tons. To the United Kingdom were forwarded 211 tons, three shipments, amounting to 155 tons, going to Liverpool. Shipments were also made to London and Hull. One hundred and eighty-seven tons went to Rotterdam and smaller lots were exported to Malta and Stettin. Four hundred and forty-six tons in one lot were forwarded to South Africa. Mexico took six shipments, making a total of 286 tons. To Australia, the Philippines, Chile, Buenos Ayres, Rosario, China and Japan were also consigned various quantities.

The American Steel & Wire Company from its Pittsburg and other Pennsylvania plants forwarded last month, via Eastern seaboard ports, nearly 7,500 tons of wire and wire nails to various foreign countries. Australia, South Africa, Europe, China and Japan were the principal customers.

The West End Rolling Mill Company of Lebanon, Pa., has effected a settlement with its striking iron workers, who went out on May 1 for a $4.50 scale. The company has agreed to pay the wages demanded, in the event of the Reading Iron Company accepting the new scales. The Lebanon Iron & Steel Company is operating its plant in Lebanon under similar agreement with its men.

Combine Discussed Again.

The American Car & Foundry Company and the Pressed Steel Car Company are again discussing a possible merger of interests. While nothing absolutely definite has been accomplished, Pittsburg men interested in the local concern, admit that there is much more than talk in the affair.

It is said that the possibilities of a severe competition in the near future for the Pressed Steel Car Company by the new Standard Steel Car Company and other steel car manufacturing concerns that are springing up at this time has decided the Pressed Steel Car Company to strengthen its position by an alliance with its *powerful neighbor.*

At first the alliance was said to be intended only as a working agreement, but this idea is now said to have been abandoned and a straight merger of the two corporations is the plan which has taken hold with much energy on the minds of the leaders of the two great enterprises. Should it be carried through, it will bring into one organization business interests with a combined capital of $65,000,000. It will also merge 22 manufacturing plants representing different portions to the railway car industry and will give the new combine control of all the parts of railway cars which forms a complete car of either freight or freight or passenger or traction service.

At the present time the Pressed Steel Car Company goes into the open market for wheels and other minor portions of its cars, and only turns out freight cars. The American Car & Foundry Company makes wheels, couplers, draw heads and castings of all kinds; in fact everything tht is needed.

The American Car & Foundry Company, which was organized in 1899, has a capital of $60,000,000. This is divided evenly in preferred and common stock. It has no bonded debt and its surplus now amounts to $5,074,950. Its 16 plants are located in Detroit, St. Louis, Berwick, Pa., Jeffersonville, Ind., Depew, N. Y., St. Charles, Mo., Chicago, Terre Haute, Buffalo, N. Y.; Huntington, W. Va., Minerva, O., Milton, Pa., Indianapolis, Ind., Wilmington, Del.

The company also operates car wheel works, bar iron mills, axle works and railway castings plants. It has a capacity of 800 passenger cars, 90,000 freight cars, 900,000 chilled iron car wheels 30,000 tons of cast iron pipes, 90,000 tons of bar iron and axles and 130,000 tons of castings.

A wire drawing plant is building in Rome, N. Y., by the James A. Spargo Company.

Ship Building Combination.

Arrangements were completed in New York June 7 for underwriting the bonds that will be issued by a corporation formed to consolidate at least five ship-building yards of the country. This amalgamation was attempted last year, but failed because of dissatisfaction of the investing public with the form of the securities. The project was never abandoned and since May, 1901, the plans have been slowly maturing.

Among others known to be concerned are the Bath Iron Works and the Bath Windlass Company of Bath, Me.; the Crescent ship yards of Elizabethport, N. J.; the Newport News Shipbuilding & Dry Dock Company of Newport News, Va.; the Union Iron Works of San Francisco and Harlan & Hollingsworth of Wilmington, Del. At the head of this great concern as manager will be Lewis Nixon of the Crescent ship yards who is also closely allied with the Cramps of Philadelphia. Ships will be operated as well as built, and further development of the combination is contemplated.

One More Merger—A conference was held at Milwaukee June 8 by officials of the United States Steel Corporation and representatives of the Allis-Chalmers Company and the Wisconsin Bridge & Iron Company. Mr. Schwab's private secretary and the chief consulting engineer, were present.

The session was held to devise plans for the amalgamation of the bridge and iron and Allis-Chalmers plants in Milwaukee, in a second billion dollar consolidation.

Edwin Reynolds, chief engineer of the Allis-Chalmers Company said:

"While I have no hesitancy in saying that there is a good field for a billion dollar trust, I am ignorant of any conference held here between the Schwab and Allis-Chalmers people. I understand Eastern men were in the city, but I cannot say as to the purpose of their visit."

The Colonial Paint & Varnish Company, Cleveland, O., recently purchased a strip of land at the corner of Hamilton and Marquette streets that city, for the purpose of erecting another building and increasing the capacity of the company. The new building will be of brick and will have three stories and a basement.

The open-hearth department of the Sharon Steel Company, Sharon, Pa., produced 19,4[illegible] tons out of 365 heat during May. This exceeds April's record-breaking production by over [illegible] tons. All of the eight furnaces were not operated, some being off for repairs.

IN AND ABOUT PITTSBURG.

The American Foundry & Machine Company, which will build its new plant in Hazelwood, has awarded to Samuel Hay, Pittsburg representative of the Whiting Foundry Equipment Company, Harvey, Ill., a contract for the foundry equipment. The contract for the cranes was awarded to Pawling & Harnischfeger, Milwaukee.

Application is to be made for a charter for the Neely Nut & Bolt Company which will take over the business of the partnership of the Marland-Neely Company, limited, which has been operating a plant in South Twenty-second street. The incorporators are John Bindley Edward Bindley, Thomas Neely and others.

Work is being rapidly pushed on the new plant of the McKeesport Manufacturing Company, Port Vue. The plant will start with 10 hot mills, but the company has enough ground to double the plant whenever the business demands it. The new mill is expected to turn its first wheel about November 1.

The Washington Coal & Coke Company of this city, will soon let contracts for the construction of 100 new coke ovens to be built at Star Junction, where the same interests are now operating 475 ovens.

The machine and nut departments of the Oliver Iron & Steel Company's plant at South Tenth and Muriel streets was totally destroyed by fire Tuesday morning, this week.

A new warehouse will be added to the works of the New Castle Forge & Bolt Company, New Castle. The new building will be 60x64 feet built of structural steel.

A new engine room and a department for cleaning and annealing are being built at the Hartman Manufacturing Company's plant New Castle. The foundations are being made of solid rock and concrete, and are expected to be completed about July 1.

The Star Manufacturing Company has been organized by Messrs. Louis H. Martell, Anson B. McVay and Howard S. Evans.

NOTES OF THE INDUSTRIES.

The first annual meeting of the stockholders of the Kokomo Steel& Wire Company, Kokomo, Ind., which is building a plant at a cost of nearly $2,000,000, was held last week. Officers for the ensuing year were chosen, as follows President, A. A. Charles; vice-president, Richard Ruddell; secretary, J. E. Frederick; treasurer, Harry Ward; Directors, Richard Ruddell, A. A. Charles, J. A. Kautz, G. W. Charles, A. V. Conradt, J. E. Frederick, Harry Ward, J. Henderson and F. E. Wickenhiser.

The Globe Machine & Stamping Company, recently incorporated, Cleveland, O., is increasing its plant capacity by the addition of a Fosdick & Holloway radial drill, a Reed lathe and two Reserve Press Company's stamping presses. The company reports an excellent demand for its products, which include the manufacture of special machinery, punching and forming dies and stampings. The company is also placing on the market an improved emery wheel dresser.

The metal polishers and brass workers from the plumbing supply shops, Cleveland, O., who are on strike for a nine hour day may organize a company to erect a plant to be operated on the co-operative plan. The matter is in the hands of the executive board of the international union.

The business and plant equipment of the Cleveland Rivet & Forge Company, Cleveland, O., has been purchased by the Vulcans Forge Company, of Cleveland, O., which is building a 50x115 foot addition to its plant to accommodate the equipment purchased. The company will gain an increased output of 50 per cent.

Work on the large structure at Nos. 1 and 2 blats furnaces of the Pennsylvania Steel Works, at Steelton, Pa., which will be used as an electrical power plant, is nearing completion. As soon as the large building is completed the work of installing generators and other machinery will be commenced.

The Bethlehem Steel Company, South Bethlehem, Pa., has been awarded a contract or furnishing the cast iron segments to be used in the construction of the tunnel under the North river at New York City. To fill the order the company will convert part of its old Bessemer mill into a foundry.

According to the plans of the Baltimore Rolling Mill Company, a large plant for the manufacture of iron will soon be built on Fifth avenue, between Second and Fourth avenues, Baltimore. The company has secured a Delaware charter, with an authorized capital stock of $200,000, and have purchased a block of land. The property is 468 by 458 feet and contains about five acres. The company will manufact-

ure bar iron. Harry Wehr is president of the company, and Charles G. Phillips, and J. R. Bailey, treasurer and secretary, respectively.

The Quaker Manufacturing Company has begun work at Chicago Heights on its new factory buildings. The foundry will be 70x150 feet, one-story; the setting up and shipping building 50x200 feet, two stories; warehouse 50x150 feet, one story. In addition there will be an engine and boiler house and a pattern building. This company will manufacture hot air furnaces and a line of combination hot air and hot water heaters.

Cuyahoga Falls, O., is to have a new steel casting plant and the company will be incorporated under the laws of New Jersey, within 30 days, and will have a capital stock of $100,000. E. M. Young, who is interested in this plant, held a conference there recently with Chicago business men, in regard to a site for the factory. The members of the company have three places in view but have not decided upon the location. The factory will employ at first about 60 men.

The St. Louis Car Wheel Company will build a branch foundry in Atlanta, Ga. John W. Nute secretary and treasurer of the company, will have charge of the work. The building will be 95 feet wide and 230 feet long, with wings for the engine and boiler house, the coke ovens and the cupola and will cost about $75,000. The St. Louis Car Wheel Company lately determined to build a Southern branch of the company and Atlanta was selected.

The Hewitt Manufacturing Company has had plans prepared by W. Carbys Zimmerman for a brass foundry plant to be erected upon a site 400 x 100 feet, at the corner of Emerald avenue and Fortieth street, recently purchased by the company. The office and pattern shop will be of fireproof construction. The plant complete will cost about $100,000.

Extensive improvements are contemplated at the Toledo plant of the Republic Iron & Steel Company. Plans, etc., have been received for the building of five or six new puddle furnaces, several new sets of shears will be installed, and the ground adjoining the mill has been surveyed during the past week for the erection of new buildings.

Several contracts for the new rolling mill to be erected by the Youngstown Manufacturing Company, Youngstown, O., have been awarded the contract for a large compound engine went to a Youngstown firm while the Buckeye Engine Company, of Salem will also furnish an engine.

The United States Steel Corporation has about decided to remove the hoop mill at Mingo Junction, O., to Duquesne, where it can be operated by the Carnegie Steel Company. In its present location raw material has to be shipped to Mingo, but at Duquesne material can be obtained at first hand.

Roydhouse, Arey & Company, Philadelphia will build the proposed foundry building for Burnham, Williams & Company (Baldwin Locomotive Works,) Philadelphia. It will be of brick, two stories in height, 397¾ by 80.2¼ feet, and will cost $135,000.

The E. R. Allen Foundry Company has been incorporated with a capital stock of $40,000. The incorporators named are Edward R. Allen, Charles W. Allen, Lucius L. Flower, M. Henry Fralic and Hubbard E. Metcalf, all of Corning, N. Y.

The Manchester Shale Brick Company has been chartered with a capital of $20,000, for the purpose of mining clay and shale at Manchester, York county, Pa., for the manufacture of brick and other kinds of articles of commerce. The following Harrisburg business men are the incorporators: William E. Brady, D. W. Cox, Roy G. Cox, treasurer, E. Z. Gross, W. L. Gorgas, W. R. Denehey, J. H. Hoak and Leroy J. Wolf.

The Utica Industrial Company has leased a factory in Rome, N. Y., and will equip it with machinery for the manufacture of canning factory machines, etc. The building will be remodeled.

Superior Machine & Boiler Works are incorporated with a capital of $10,000, to conduct a general machine and foundry business; incorporators, William H. Pontius, Peter Weiler, John T. Smith.

There is some talk of rebuilding the 12-inch mill at the Brown-Bonnell plant of the Republic Iron & Steel Company, Youngstown, O., together with the eight-inch, 10-inch and the hoop mill.

The Ristine Company is incorporated with a capital of $10,000 to manufacture machinery; incorporators, George W. Ristine, Jr., John T. Ristine and Joseph Wright.

The William H. Ewers Engineering Company, Cleveland, O., has been organized by William H. Ewers and others with a capital stock of $5,000.

The Vulcan Coal Company, Worth, W. Va., has been organized by Messrs. A. D. Rice and others who will open up mines in the Bluefield region.

The Philadelphia Steel & Iron Company, Philadelphia, Pa., has been organized with a capital stock of $125,000.

A girder shop, 40x132 feet, will be erected by the McClintic-Marshall Construction Company, at its Pottstown, Pa., plant.

CINCINNATI NOTES.

Business conditions in the metal trades as well as other lines of manufacture in this district continue in excellent shape with the prospects bright for a strong demand for at least another year. Manufacturers are discounting the future by extending their plants where it is possible to do so, while those having no room to extend present plants are locating in the suburbs and providing for future requirements by securing sufficient ground to make extensions which may be desired. This is applicable, particularly, to machine tool manufacturers, who are enjoying an unprecedented demand for tools. While increased capacity is being acquired some trouble is experienced in securing skilled labor. A general advance of about 10 per cent in the price of machine tools is in prospect for the immediate future. There has been but a slight advance in tools the past year, though the demand has been enormous and the cost of production has been increased by advances in the price of castings and steel parts. It is expected that the advance will be general among machine tool manufacturers throughout the country. The foreign demand for tools shows little signs of revival. It is estimated that 99 per cent of the demand is from domestic users.

Work is being pushed on the extension to the shops of the Lodge & Shipley Machine Tool Company, which will be completed in September, giving an additional floor space of 36,120 square feet. Foundation has been laid for a two-story building, 60x120 feet, to be used as a screw machine department and pattern shop. A one story warehouse 40 x 120 feet will be built, and grading has been completed for a foundry building which will eventually be built. The 90x108 foot, one story, extension to the main shop will soon be completed, while a 60x60 foot, two story, addition to shop No. 2 is about completed. In the main shop is located three combination electric and air hoist cranes, two of which will be replaced by a 15 ton electric traveler. The company has a plot of ground 1,000 x 250 feet extending from Colerain avenue to Spring Grove avenue, and an adjoining plot, upon which is located shop No. 2, 100x250 feet.

The A. Streit Machine Company, this city, has plans prepared for a plant to be built in Colerain avenue. The company has one and one quarter acre of ground upon which it will build a two story machine shop, 50x150 feet, and a pulley foundry. The product of the plant is pulley lathes, boring mills and pulleys, to which will be added a general line of power transmission machinery.

The S. Obermayer Company, manufacturers and dealers in foundry equipments and supplies, is operating its three plants at Cincinnati, Chicago and Larimer on double turn. The company recently received contracts for the entire equipment of the Superior Drill Company's new foundry, at Springfield, O. The new plant being erected at Columbus, O., of the Buckeye Malleable Iron Company, the new foundry of the Laidlaw-Dunn, Gordon Company, Elmwood, O., and the Ohio Malleable Iron Company, Columbus, O.

The Tudor Boiler Manufacturing Company reports the volume of business to date to be in excess of the entire business of last year. The company has purchased ground in the rear of its plant extending to Third street for the purpose of extending its plant. The demand for the horizontal type of boiler, the manufacture of which it has recently taken up, in connection with the vertical type, is strong.

The Peck-Williamson Foundry Company, an off shoot of the Peck-Williamson Heating & Ventilating Company this city, has been organized and will apply for a charter with $10,000 capital stock, for the purpose of building a foundry at Wellston, O.

The William E. Gang Company is constructing a gallery in its plant to accommodate the light machine department, giving added room on the assembling floor. The company is building stand ard sizes of radial drills, upon which some new and original features have been recently applied.

The Cincinnati Screw & Tap Company is adding considerable machinery to its plant, having installed eight automatic screw cutting machines the past month and is in the market for fully a dozen more as well as two automatic screw slotting machines.

The Rahn, Mayer, Carpenter Company reports a heavy demand for lathes and note an occasional spurt in demand for foreign delivery. A shipment was recently made to Berlin. Its line of lathes has been increased to 32-inch, with new and improved features.

The Cincinnati Punch & Shear Company report a recent order from the newly organized Louisville Bolt & Iron Company for a 10 foot pack shear, doubling machines, sharp cutters, etc.

The Wood Shovel & Tool Company, Piqua, O., has been incorporated with $60,000 capital stock by H. K. Wood, William W. Wood, I. G. Battelle, John H. Young and B. F. Rhodehamel.

The Presslar & Crawley Company is in the market for a pulley and boring lathe, four foot or over.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—Conditions appear fixed for the remainder of the year so far as the larger proportion of the tonnage is concerned. The year's producing capacity has been fully covered in almost every line and in those departments of manufacture in which the finished steel products have not been completely sold up the raw material may go into other finished forms with advantage. There is no reason now to believe however that the allotment of raw materials for the different branches of finished steel will not be taken up as originally proposed.

The merchant interests have disposed of their pig iron for the second half of the year at prices running from 50 cents to $1 per ton below the current quotations on spot iron and an exceptionally heavy tonnage has been sold for the first quarter of next year. This is one of the best seasons in that respect in the history of iron and steel making in the United States. Pittsburg producers state than never before has there been such heavy forward buying at this season of the year. Usually there is somewhat of a slowing up about the end of the first six months for time to look about and give definite form to the tonnage of the second half of the year. This time, however, the buying rather increased and there is practically no iron available now for the last half of the year. The remarkable feature seems to be the long forward buying as shown in the tonnage that runs from July to July of next year in some cases. The top prices at the valley merchant stacks during the week was $22 for Bessemer. Mill iron is strong at $21.00 to $21.50 while No. 2 foundry has reached $23 at Pittsburg for spot delivery.

In the finished departments there is no change in the general situation. The demand for bars, sheets and tin plate seems to be expanding while the heavier forms of products are still swamped. The temporary abandonment of the official relations in the plate branch was one of the events of the week and the working out of the bad feeling among the plate makers will be watched with more than ordinary interest.

They have been discussing the question of higher prices for some time but while the smaller producers advanced values the larger plants adhered to the nominal quotations and quoted them for next year's delivery. How this will affect the element which fought reasonably enough for higher prices remains to be seen, but there is no doubt that there will be a reaction if the larger plate mills remain willing to continue the present purely nominal prices for delivery next year. While material continues short of the demand, however, the high price contingent will be able to name prices regardless of the controlling power in iron and steel production.

CURRENT QUOTATIONS:

Basic	$20 50	22 75	Splice bars	1 50	
Bessemer		22 75	Angles	1 60	
Charcoal, hot	82 00		I beams	1 60	
Charcoal, cold	82 50		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 70
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	36 00		No. 1 cast	17 00	17 50
Open hearth	37 00		Iron rails	25 00	2[illegible] 00
Steel bars	1 50		Car wheels	18 00	19 00
Iron bars, refined		2 10	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	3 00	
Bolts, iron, sq nut	2 50		Sheets, 27	3 10	
Hex nuts	2 65		Sheets, 28	8 20	
Spikes	2 00				

Philadelphia—Aside from the labor troubles there is not much of interest to report in the iron and steel trade this week. The market for all products is exceedingly strong and the restriction in the output of pig iron by the strike of the furnace, workmen in the Mahoning and Shenango valleys is certain to be felt in steel and finished material.

The coal trouble is also causing some curtailment in the output of pig iron. The scarcity of anthracite coal proves particularly troublesome to those furnaces which are running on low phosphorous pig, which they cannot make with ordinary coke. This means further reliance upon foreign markets, and, as a matter of fact another round lot of low phosphorus pig iron has recently been purchased abroad.

Prices in the local pig iron market are not materially different from what they were a week ago. Pig iron for delivery during June and July commands fancy prices. For the last quarter of this year and the first quarter of next year $20.25 to $20.75 could possibly be done, but there does not appear to be much buying except for steel making purposes, basic iron bringing from $19 to $19.25, although for the last four months of this year pretty close to $20 has been paid for this grade of iron. Some foreign iron is being delivered in this and other Eastern ports. For shipment during the last quarter of this year the following prices prevail for the standard brands of Northern iron, earlier deliveries about $1.50; higher; No. 1 foundry, $20.50 to $21.50; No. 2 foundry, $19.75 to $20.50; gray forge, $18.50 to $19.

In domestic steel billets transactions are exceedingly scarce. Nominal quotations for Ameri.

can steel are $34 to $35; English, $31.50 to $32.50; German, $30 to $30.50.

The finishing iron and steel mills continue under pressure, particularly in structural steel and plates. The plate makers are offering very little material, but here as in some other lines buyers who offer premiums seem able to get what they want. Buying of structural shapes for delivery after January 1 goes on steadily, and some little foreign material is coming in. There is also a good demand for sheets, and prices are working higher on account of the increased cost of production. Nominally quotations are about as follows for seaboard deliveries, with special rates for immediate shipments: Beams and channels, 2.25 c. to 2.5 c.: angles, 2.25c to 52c: universal plates, 2.2c to 2.05c.; steel bars. 1.9c. to 2c.; refined bars, 2.05c to 2.01.

CURRENT QUOTATIONS:

Foundry, 1	$20 50	21 50	Girder rails	32 00	32 50
Foundry, 2	20 00	20 50	Angles, 3" & lr'gr		1 80
Gray Forge	18 50	19 00	Under 3-inch		1 90
Bessemer billets		34 00	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown, & Company—It needed only a series of labor disturbances to complete the confusion in the iron trade, and these we are likely to have. In addition to the anthracite coal strike, which has already sharply curtailed output of pig iron in Eastern Pennsylvania, there is every probability that the miners of bituminous coal in the Pocahontas and New River districts will stop work on Saturday. These districts supply coke not only for about 30 furnaces in Virginia, but for many also in Ohio and the West. A protracted suspension would of course again cut into pig iron product.

The strike of furnacemen in the valleys near Pittsburg was not averted, as expected. At this writing 18 furnaces in Mahoning and Shenango valleys are banked for an indefinite time. Except three belonging to the Republic Iron & Steel Company. These are all merchant stacks, making mostly Bessemer pig for the Pittsburg market. It is not disclosed why the strike does not affect the furnaces of the United States Steel Corporation. An effort is being made to bring out the men at the 34 furnaces in Pittsburg district. A curious phase of this strike, illustrative of the quality of labor leadership at the moment, is that if the men win, and furnaces concede their demand for eight hours shift at same pay as 120 hours, they would have no work. for it is a physical impossibility at this time to secure the extra 50 per cent of skilled labor needed to operate.

It is hardly necessary to add that the market for materials is very much mixed. The pig iron product for the year is so near sold that quotations for little available lots are whatever holders choose to make them. Scotch, English and German prices, American Seaboard delivery, are up about a dollar, on account of American demand. settlement of Boer war and better freights

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$20 65	21 00	Angles	2 00	2 50
No. 2X fdy Jersey City	21 50	22 50	Tees	2 00	2 50
No. 2 plain Jer. C.	19 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	22 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	21 00		Com. base, bars per 100 lbs.	1 65	1 70
No. 3 fdy N. Y.	20 50		Refined base, bars	1 85	1 90
No. 1 soft	17 75		Bands, base	2 40	2 50
No. 2 soft	18 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 50	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5	to 70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

Chicago—It can not be learned that there is in this territory any severe inconvenience or suffering among the melters of pig iron because of the inadequacy of material. A few foundries are closed because of a lack of iron, but generally consumers manage to secure enough iron to continue in operation. Spot shipments still bring about $1 or $1.50 per ton more than for deliveries during the first half of 1903. Of the latter trade there is fair activity this week. Almost all producing companies are in a position to sell for those extended deliveries but for immediate shipment the number of sellers is very small. Buyers are leisurely testing the market. They find that for January to July needs $16.50 Birmingham, or $20.15, Chicago is about bottom and for quick shipment, $21.15 to $21.65, Chicago to No. 2 foundry. Local irons sell from $21 to $22 for No. 2 according to time limit of shipment.

Inquiries for steel rails continue, with an occasional good sale for 1903 wants. There seems to be no special activity in any other branch of finished steel, though none of the products are dull. The high store prices for quick shipments are well maintained and the market is quite firm. Iron bars have been advanced by some mills but other Western mills are slightly lower for quiet shipment. This weakness, however, is believed to be only temporary.

There is a very marked disposition for sales of old material to extend farther and farther into the future. Some of the Western railroads have sold their scrap for many months ahead

the buyers being large consumers. Prices for all kinds of scrap are strong.

CURRENT QUOTATIONS:

Bessemer	22 00	23 00	Sheets, 26 store	3 25	3 40
Fdry Nohn 1	21 50	22 50	No. 27	3 35	3 50
Northern 2	21 00	22 00	No. 28	3 45	3 60
Northern 3	20 50	21 50	Angles	1 75	
Southern 1	20 65	22 15	Beams	1 75	
Southern 2	20 15	21 65	Tees	1 80	
Southern 3	19 65	21 15	Zees	1 75	
Forge	19 15	20 65	Channels	1 75	
Charcoal	22 50	23 50	Steel melt'g scrap	18 00	19 00
Billets, Bessemer	33 00	34 00	No. 1 r.r. wrought	21 00	22 00
Bars, iron	1 80	2 00	No. 1 cast, net ton	15 00	16 00
Bars, steel	1 75	1 85	Iron rails	24 00	25 00
Rails, standard	28 00	30 00	Car wheels	20 00	21 00
Rails, light	34 00	40 00	Cast borings	10 00	11 00
Plates, boiler	1 90	2 00	Turnings	13 50	14 00
Tank	1 75	1 80			

Cincinnati—The pig iron market is quiet but firm. Some furnaces are out of the market, and will make no further sales until autumn. There are numerous inquiries for iron, and any small lots are taken up quickly at any price asked. It is understood that no more iron will be sold for this year's deliveries, as sellers are busy delivering what they have sold.

In many lines consumers are inconvenienced by the delay in getting raw material forward on time. This is the distressing feature of the situation, and unfortunately, can not very well be bettered for some months to come.

Store trade in finished materials is not so keen as it was a month or two ago. There is no change in general condition of extreme scarcity, but while prices are very firm they are not this week going any higher. But it is at best a truce. No one knows what the future will bring. The large producers are undoubtedly trying to keep prices down to or near the present levels.

Iron bars are in good demand, and their advance over steel bars is maintained.

Old material is not active. Holders are offering little and consumers do not appear to be eager to buy. The lull may be temporary, but while it lasts the market has greater steadiness than it has shown for months.

CURRENT QUOTATIONS:

South. fdy. 1	20 25	$20 50	Standard Sections	29 90	30 90
South fdy. 2	19 75	20 00	Sheet, 26	3 40	
South. fdy. 3	19 25	19 50	Sheets, 27	3 50	
South. fdy. 4	18 75	19 00	Sheets, 28	3 60	
Grey forge	18 75	19 00	Angles, 3 to 6 in	1 70	
Mottled	18 75	19 00	Angles, 1¼ to 2½	1 82	
South 1, soft	20 25	20 50	Beams and Chanl 15 in and under	1 70	
South 2, soft	19 75	20 00	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	22 00	22 50	Tees	1 75	
L. Superior, 2	21 00	21 50	Z's	1 70	
L. Sup'r char'l c w	22 00	23 00	1 wrought scrap	19 00	20 00
Hang'g r'k ccl, 1	26 00	28 00	Steel mlting stock gross ton	16 00	
Sohn ccl c w	20 35	20 60	No. 1 cast	18 00	
Jaksn cy. silv'y 1	21 50	22 00	Old iron rails g t'n	22 00	
St'l brd base hlf ex	1 72		Old car wheels	20 00	
Iron bars	1 82		Cast borings	6 50	9 00
Flange plates	1 80		Turnings	12 00	
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

Birmingham.—Alabama's pig iron and steel market conditions are very active, though there is very little selling for the reason that furnaces are well sold ahead and cannot afford to guarantee much iron for delivery this year beyond that already booked. There could be some sales made for delivery in 1903, but the furnacemen in this district do not seem inclined to start on the business for the coming year as yet. Quotations are on the $16 basis for No. 2 foundry. However, it is admitted that these prices are being bettered, in immediate delivery iron, from $1 to $2 per ton. The production in this state at present is none larger than the demand and shipments are steady. There is no iron accumulating. The furnaces in operation are doing well. There is a good supply of raw material with the exception of coke, which is a little scarce and is quite expensive.

During this week the big, new furnace of the Republic Iron & Steel Company, at Thomas, will be blown in. This furnace was to have been blown in last week but just before the torch was applied it was discovered that the blowing engines did not run smoothly and the blowing was delayed for few days. The furnace will have a daily capacity of between 200 and 300 tons a day.

Ground has been broken by the Woodward Iron Company for a third furnace at Woodward, in the Birmingham district, and before the expiration of 12 months it is believed the stack will be ready for the torch. A first class, modern furnace will be built.

The Sloss-Sheffield Steel & Iron Company will hardly be able to blow in its second city furnace until about July 1. The blowing engine which will be added to the plant has arrived and it is now being placed in position. The Sloss-Sheffield Company desires to put the plant in operation just as soon as possible.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$17 50	18 00	Tank	1 80	
No. 2 fdy, Sohn	17 00	17 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	16 00	16 50	No. 1 wrought	14 00	
Grey forge, Sohn	15 50	16 00	No. 1 cast	12 00	
Billets	28 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	3 50
Boiler plates	1 90		No. 28 sheets	3 10	3 50
Fire box	2 00				

Coal.

Pittsburg—The better car supply has worked to the advantage of the coal shippers of this district but there still remains much to be desired in that direction. Last week was the first really good week the coal men have had but the coke shippers have had no cause for complaint as their movement jumped to the record point.

Chicago—The beginning of an accumulation of bituminous coal by large Western consumers,

noted a week ago, has developed into a quite marked buying movement. Railways and large manufacturing companies are stocking up, quietly in some instances but steadily, to the fullness of their capacities. The explanation is an apprehension that the coal strike may extend to the Western bituminous mines. Eastern coals are not arriving freely, because of scant car supply and the controlling and superior demand for the product in the East. Coke is becoming very scarce and values have risen 50 cents per ton.

Cleveland—Aside from the contracting in coal the week was lifeless in that trade. The end of the week brought the reports that certain mines in the Pocahontas district in West Virginia have gone out on a strike. It is too early yet for the shippers to figure the consequence until the movement is more nearly general, if it is to become soon. The Pocahontas district, while sending some coal to Northern Ohio and while shipping some by the lakes, sends most of its coal down the river, and consequently is not so much of a factor in the lake situation. The coal supply for quick shipment is short again, and the shippers are having considerable difficulty in getting enough material to keep their contract boats going, howbeit there are some loads showing up at other ports than Cleveland for the smaller class of tonnage.

Cincinnati—The price of coal was advanced last Friday by all of the elevator and retail dealers in the city, effective at once. The advance was 25 cents a ton, putting the price down town at \$3.00 a ton, and on the hill \$3.25, as the minimum until September 1, though it is stated that the price may be advanced any time between now and September 1. There may be an extension of the strike into the West Virginia and Pittsburg soft coal districts. Advices received by coal men were that this would be the result, and it is largely on account of this fear that prices were advanced. The price of anthracite is \$7.00 a ton, but there is practically no coal at any price. There is much probability of another increase in price of soft coal this week. The wholesale prices quoted are \$2.50 on the cars for lump coal, and run of the mine \$2.25. Slack is practically not to be had, but may be quoted at \$17.

Coke.

A summary of the Connellsville region for the week shows 20,618 ovens in blast and 668 idle.

The following figures show the scope of operations.

Production for the week	246,754 tons.
" last week	245.828 tons.
Increase	916 tons.
Shipments—	
To Pittsburg and river points	4,101 cars.
To points West of Pittsburg	4,915 cars.
To points East of Everson	3,038 cars.
Total	12,054 cars.
Last week	12,206 cars.
Shipments in tons for week	251,800 tons.
" " " last week	254,800 tons.
Increase	3,040 tons.
Masontown Field	
Shipments for week	529 cars.
" last week	607 cars.
Decrease	78 cars.
Shipments in tons	13,754 tons.
" last week	15,789 tons.
Decrease	2,035 tons.

Coke Prices.

Pittsburg—Furnace, \$3.25@3.50. Foundry, \$3.50@3.75.
St. Louis—Connellsville, \$5.25@5.50. West Virginia, \$4.25@4.50
Cincinnati—Connellsville, \$5.00@5.25. Kanawha \$4.60 Stonega, \$4.60

Wire and Nails.

Wire, plain, car lots, jobbers	\$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	11.00	c
Copper, light bottoms	9.50	c
Heavy Composition	11.00	c
Brass Turnings	7.00	c
Heavy Brass	8.00	c
Light Brass	6.75	c
Heavy Lead	3.80	c
Tea Lead	3.60	c
Zinc Scrap	3.25	c
No. 1 Pewter	21 50	c

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots......37c. pr lb.	1000 lb. to ton lots......34c.
100 lb. " ......35c. "	ton lots and over......33c.

No. 2, 90 Per Cent. Pure in Ingots.

small lots......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb
100 lb. " ......33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb
100 lb. " ......36c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots......36c. pr. lb.	1000 lb. to ton lots...... 29c. pr. lb.
100 lb. " ......30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time, \$1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, \$1.25 per lb., in small lots; lot of 100 pounds, \$1.10 per lb.; special price on large lots

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including June 9, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	225,801	113,073
Tidewater	73,317	23,035
Southwest	10,355	70,829
Eureka	9,357	245,094
Buckeye, Macksburg oil	13,668	95 439
New York Transit	158,953	
Southern	125,790	....
Crescent	44.021	....
Total	661,406	549,809
Daily averages	82,676	68.726
Buckeye / Indiana Local Division	47,546	362,925
Daily average	55,946	44,116

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
June 4	$1.85	$1.20	$1.20	$0.88	$0.83	$0.83
June 5	1.85	1.20	1.20	0.88	0.88	0.83
June 6	1.85	1.20	1.20	0.88	0.83	0.83
June 7	1.85	1.20	1.20	0.88	0.83	0.80
June 9	1.85	1.20	1.20	0.88	0.88	0.83
June 10	1.85	1.20	1.20	0.88	0.83	0.888

The Metal Markets.

LONDON—Tin—£133 5s-£131 5s. Sales 630 tons spot; 1,710 tons futures.

Copper—£54 10s £53 17s 6d. Sales 1,575 tons spot; 1,375 tons futures.

Lead—£11 7s 6d-£11 2s 6d.

Spelter—£18 12s 6d-£18 5s.

NEW YORK—Tin—$30.62½-$29.87½.

Copper—Lake, 12⅞-12⅝.; electrolytic, 12⅛-12⅜: casting; 12⅜-12¼.

Lead—$4.15 Spelter—$4.90-$4.75.

ST. LOUIS—Lead—$3.97½-$3.95½.

Spelter—$5.00-$4.65.

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs	4 40
Bessemer Steel, 95 lbs	4 35
Bessemer Steel, 90 lbs	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4 10 for 100 lbs.; $4 05 for 95 lbs., and $4 00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4 90 Bessemer Steel, 100 lbs. $4 75

The Roach & VanWyck Machine Tool Company, builder of 15 inch engine lathes, will have its new plant, in Cumminsville, completed in about six weeks, when an increased capacity of 100 per cent will be gained.

To increase its moulding department capacity the March-Brownback Stove Company will move one of its buildings from Linfield to the Pottstown, Pa., plant.

Albert Schoell, Philadelphia, has posted plans for a new brass foundry to be built at Twelfth street and Washington avenue, that city.

Total Lack of Harmony.

The resignation of Percival Roberts from the board of managers of the United States Steel Corporation has furnished the basis for a dozen more or less interesting stories, all of which Mr. Roberts disposed of a few days ago in a few terse sentences.

"I resigned," he said, "from the board of managers of the United States Steel Corporation because I differed with President Schwab in important matters affecting the management of the corporation. I have not thought of organizing an independent concern, and certainly I will not do anything that would embarrass the managers of the United States Steel Corporation. My differences with Mr. Schwab were not restricted to the management of the American Bridge Copmany, as has been reported, but instead related to the affairs of the controlling corporation."

Ore Situation at Cleveland.

The ore situation is less complex than at any time since the car supply has not shortened and the movement of the material is much more satisfactory than it was the latter part of the month. The shippers are showing a further determination to increase the movement in June over what was achieved in May, and if the present supply of cars continues there will be little doubt of the result. Last week was exceptionally good for the shippers in the aggregate moved. The shippers, freed from the delays which have harassed them through all of the active period of this year, have sent material forward more freely than many expected would be possible this year. The ship owners experienced the same relief and boats which have been spending a week at the unloading docks have been getting away in fair shape. Whether this is merely a spurt or the beginning of good things no one knows or is willing to predict. There has been a fair demand for boats at the head of the lakes all week and rates remain unchanged.

A MATTER OF HISTORY.

The Chicago, Milwaukee & St. Paul Railway, popularly known as "The St. Paul Road," began the use of electricity for train lighting in 1888. In that and many ways it has been a poineer in the adoption of comforts for the traveler. In building the world famous Pioneer Limited trains a mark was set in luxury and beauty of cars that has never been equaled, and probably never will be.

West Virginia News.

J. N. Wilkinson, of Bridgeport, W. Va., has optioned over 100,000 acres of coal land in Wood county and has authorized his agents to serve notice of acceptance. It is believed that the Standard which has been buying much coal elsewhere is back of the deal. It involves more than $1,000,000.

The Carter Alkire Coal Company, has been chartered at Shinnston, W. Va., by James Carter of Shinnston, and others. The company will install mines and open new towns.

Henry Schmulbach, of Wheeling, is contemplating building a large brewery at Fairmont, W. Va.

C. H. Straub, T. E. Joyce, and Eugene Sommerville, of Grafton have applied for street rights for a new road in that town: length of road about six miles.

The Ronceverte, Lewisburg & Western railroad,has been chartered, with $100,000 capital by D. T. C. Davis, Jr., A.F. Matthews, W. E. Nelson, John A. Preston, and H. L. Vansikle, of Lewisburg, and W. G. Matthews, of Charleston. The company proposes to construct a road from Ronceverte, Greenbrier county, to Lewisburg.

The Greenbrier Coal & Coke Company, has just finished 72 coke ovens in McDowell county, and 28 more will be finished by July 1. The Fulton Coal Company, is figuring on 20,000 acres of and, the first to be taken up in Calhoun county, which joins the Greenbrier company's property.

Ronceverte, W. Va., has ordered an issue of $18,000 worth of bonds for a new water station.

Bellaire is to have a new enamel plant. A charter will be applied for in a couple of weeks

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Capital Stock Increased—The Vulcan Crucible Steel Company, Monaca, is to enlarge its plant and become an important factor in that line of business in Pittsburg. A meeting of the stockholders of the company was held at which it was voted to increase the capital stock from $300,000 to $500,000, and to apply the additional capital on betterments and enlargement of its plants.

President Kidd, who has been at the head of the corporation since its organization, resigned and the board of directors elected John Caldwell, treasurer of the Westinghouse Air Brake Company, to succeed him. The Westinghouse interests are among the largest users of tool steel in Pittsburg.

The Vulcan company operates under special patents and a new process in the manufacture of tool steel. The enlargements include an additional crucible pot floor, with a capacity of nine tons daily: also a rolling mill, additional puddling furnaces and some large hammers. It is intended to make the capacity 18 tons a day. This grade of steel being quoted at about 35 cents a pound shows the extent of the enterprise.

Restraint is Asked—In the United States circuit court, this city, Gordon, Strobel & Laureau filed a bill in equity against the Carnegie Steel Company, the Best Manufacturing Company and James Gayley. The complainants allege that they are the owners of a patent device for protecting furnaces and that the Best Manufacturing Company and James Gayley are about to manufacture the device and sell it to the Carnegie Steel Company. The court is asked to restrain the manufacture and sale of the device.

Patents.

The following patents granted June 3, 1902 are reported expressly for THE AMERICAN MANUFACTURER by J. M. Nesbit, Patent Attorney, Park building, Pittsburg, Pa. from whom printed copies may be procured for 15 cents each:

Smoke consumer, David Clump and William Hofmeister, St. Louis; rotary engine, J. F. Craig and T. V. Fleming, Paris, Ill.; valve gear, S. I. and W. S. Crain, Cincinnati; sand reel for oil wells, H. W. Eaton, Jr., and Andrew Benson, Bradford, Pa.; rotary engine, F. A. Headson, LaFayette, Ind.; steam generator, William Sharkie and David Crawford, Glasgow, Scotland, rotary engine, S. C. Shepard, Hanibal, Mo.; steam engine valve, Anton Tandler, Chicago; process of hardening copper, S. L. Walter and F. W. Kelner, Ekastown, Pa.; means for counterbalancing the momentum of reciprocating bodies, M. N. Forncy, New York; muffler for steam or other engines, T. S. McKinnie, Cleveland, O.; pumping power for oil wells, G. D. Newton, Cleveland; internal combustion engine, Fritz Reichenbach, Berlin, Germany; valve, J. J. Rylands, Millvale, Pa. assignor to Homestead Valve Manufacturing Company, Homestead, Pa.; feed water heater, F. W. Shupert, Spokane, Wash.; steam trap, Frederick Tudor, Brookline, Mass.; rotary engine, W. F. Bangs, Baton Rouge, La.; electric pumping engine, Steven Brunau, Koping, Sweden, assignor to De Laval Steam Turbine Company; regulator for steam generators, Thomas Clarkson, London, England; guide for punching presses, Thomas and J. R. Coley, Pittsburg; method of and apparatus for shipping metal receptacles, M. L. Deering, New York, assignor to Standrd Oil Company (2); mechanical stoker, A. F. Nagle, Montclair, N. J.; steam engine valve, E. L. Sauer, Chicago,; valve gear, E. J. Armstrong, Erie, Pa.; tapping jacket for furnaces, Miles Barrett, Grand Forks, Canada; method of heating mandrels for rolling tubes, George H. Everson, Pittbsurg; machine for drilling spoke holes in wheel fellies, same; silica brick and process of producing same W. H. Gibson, Homestead, and Henry Wessling, Hope Church, (Pa. 2); engine governor, J. F. O'Neill, St. Louis; revoluble car dumping structure Erskine Ramsey, Birmingham, Ala ; steam or joint for steam boilers, S. M. Vauclain, Phildelphia, assignor to Burnham, Williams & Company, same place; fine fuel burner, C. A. Dally, Carnot, Pa.; fluid pressure pump, James McCulloch, Portreath, England.

The Rule Was Granted—Vice Chancellor Emery, at Newark, N. J., June 7, granted a rule on the United States Steel Corporation to show cause why it should not be restrained from carrying out its purpose of retiring $250,000,000 worth of seven per cent preferred stock and issuing instead five per cent bonds. The rule is made returnable today at Newark. The suit was instituted by William Berger.

TRAVEL LIKE PRINCES.

Those who saw the special train in which H. R. H. Price Henry of Prussia made his tour of the United Sates are comparing it with other trains in regular service, and it is admitted that none of the cars in the train compare favorably with the buffet, compartment and standard sleeping cars of the Pioneer Limited trains of the Chicago, Milwaukee and St. Paul Railway in daily service between Chicago, St. Paul and Minneapolis. The people of this country have the satisfaction of knowing that at any time they can not only travel like Princes, but can get much better service.

Condition of the Blast Furnaces in the United States, June 1, 1902.

Compiled for the AMERICAN MANUFACTURER AND IRON WORLD.

LOCATION OF FURNACES.	CHARCOAL. Total No. Stacks.	In Blast. No.	In Blast. Weekly capac'y	Out of B'st. No.	Out of B'st. Weekly capac'y	ANTHRACITE AND COKE. Total No. Stacks.	In Blast. No.	In Blast. Weekly capac'y	Out of B'st. No.	Out of B'st. Weekly capac'y	BITUMINOUS AND COKE. Total No. Stacks.	In Blast. No.	In Blast. Weekly capac'y	Out Bl'st. No.	Out Bl'st. ly
Alabama	5	3	1,080	2	450						39	31	28,539	8	5,590
Colorado											3	3	4.382	0	0
Georgia	4	2	700	2	375						1	0	0	1	740
Illinois											19	18	34,584	1	2,000
Kentucky											8	5	2,081	3	1,380
Maryland }	5	2	189	3	210						5	4	5,986	1	500
Virginia }											21	17	11,418	4	2,142
Missouri	1	1	336	0	0						1	1	722	0	0
New England	7	3	269	4	340										
New Jersey						9	4	4.050	5	2,713					
Spiegel						3	8	482	0	0					
New York	3	3	759	0	0	7	2	1,507	5	2,798	10	3	4,993	7	5,130
North Carolina											2	0	0	2	463
Ohio—Eastern, Central and Northern											28	23	40,994	0	0
Hanging Rock District	7	3	183	4	337						12	11	5,894	1	54
Hocking Valley											3	2	841	1	350
Mahoning Valley											18	6	14,801	7	14,157
Oregon	1	0	0	1	280										
Pennsylvania general	9	2	100	7	546						6	5	5,725	1	1,150
Juniata and Conemaugh Valleys											15	10	14,241	5	2,058
Lebanon Valley						11	9	6,378	2	1,100					
Lehigh Valley						30	21	11 801	9	4.845					
Pittsburg district											} 34	33 {	80.342	1	1,800
Spiegel													2,310		
Schuylkill Valley						16	13	11,458	3	1,610					
Shenango Valley											18	8	14,872	10	13,220
Susquehanna Valley, Upper						2	1	325	1	335					
Susquehanna Valley, Lower						11	7	6,751	4	1,350					
Tennessee	3	1	82	2	615						18	13	8,575	5	2,650
Texas	4	0	0	4	890										
West Virginia											3	8	3,941	0	0
Wisconsin and Michigan	9	7	4,079	2	706										
Wisconsin and Minnesota											6	5	5,373	1	665
Total	58	27	7,770	31	4,749	89	60	42,747	29	14,751	260	201	290,153	59	53,574

Blast Furnaces June 1, 1902.

The following table gives the number and capacity of furnaces in and out of blast June 1, 1902:

Condition of Blast Furnaces in the United States June 1, 1902.

Fuel.	In Blast. No.	In Blast. Weekly Capacity.	Out of Blast. No.	Out of Blast. Weekly Capacity.
Charcoal	27	7,776	31	4,749
Anthracite and Coke	60	42,747	29	14,751
Bituminous and Coke	201	290,153	59	53.574
Total	288	340,676	119	73,074

Compared with May 1, the standing of the furnaces in blast was as follows:

Furnaces in Blast May 1, and June 1, 1902.

Fuel.	May 1. No.	May 1. Weekly Capacity.	June 1. No.	June 1. Weekly Capacity.
Charcoal	22	6,792	27	7,776
Anthracite and Coke	59	41.543	60	42,747
Bituminous and Coke	207	309.517	201	290,153
Total	288	357,852	288	340,676

The above comparison shows:

Increase in active charcoal furnaces, 5.
Increase in weekly capacity charcoal furnaces, 984 tons.
Increase in active anthracite and coke furnaces, 1.
Increase in weekly cap. anth. and coke furn's, 1,204 tons.
Decrease in active coke and bituminous furnaces, 6.
Decrease in w'kly cap. bit. and coke furnaces 19,364 tons.
Net decrease active furnaces, 0.
Net decrease weekly capacity, 17,176 tons.

The following tables show the anthracite and coke and the bituminous and coke furnaces in blast in the various districts May 1 and June 1.

Anthracite and Coke Furnaces in Blast May 1, and June 1, 1902, by Districts.

District.	May 1. No.	May 1. Weekly Capacity.	June 1. No.	June 1. Weekly Capacity.
New Jersey	3	3,597	4	4,050
Spiegel	3	536	3	482
New York	2	1,398	2	1.507
Penna—Lebanon Valley	9	6.668	9	6,378
Lehigh Valley	28	12.644	21	11.801
Schuylkill Valley	11	9,467	13	11.453
Susquehanna Val. Upper	1	350	1	325
Susquehanna Val. Lower	7	6,883	7	6,751
Total	59	41,543	60	42,747

Bituminous and Coke Furnaces in Blast May 1, and June 1, 1902, by Districts

District.	May 1. No.	May 1. Weekly Capacity.	June 1. No.	June 1. Weekly Capacity
Alabama	30	28,815	31	28.539
Colorado	3	4.213	3	4.382
Georgia	0	0	0	0
Illinois	18	35,106	18	34,584
Kentucky	5	2.200	5	2,081
Maryland	4	6,253	4	5.985
Missouri	1	885	1	722
New York	4	6,135	3	4,993
North Carolina	0	0	0	0
Ohio—East'n. Cent. & Nth'n.	22	38,372	23	40.994
Hanging Rock	11	6,618	11	5.894
Hocking Valley	2	898	2	881
Mahoning Valley	12	27,178	6	14.301
Pennsylvania, general	5	5,718	5	5,725
Juniata & Conemaugh Val.	9	13.615	10	14.241
Pittsburg district }	32	79,328	33	80.342
Spiegel }		2,587		2,310
Shenango Valley	16	25,199	8	14,872
Tennessee	10	6,530	13	8,575
Virginia	15	10,496	17	11,418
West Virginia	3	4,238	3	3,941
Wisconsin & Minnesota	5	5,093	5	5,373
Total	207	309,517	201	290,153

The Metallurgy of the Cupola.

By H. E. FIELD, Ansonia Conn. [Presented at the Boston meeting of the American Foundrymen's Association.]

THE quality of cast iron depends, to a great extent, upon cupola practice. The best of pig iron can be changed into inferior cast iron by poor melting; while an inferior pig may, by judicious melting and mixing, be used in high grade castings. There are hardly two cupolas in existence which work under exactly the same conditions; with the same sized tuyeres; the same amount of blast; with equal height of tuyeres from cupola bottoms, etc. For every variation in cupola arrangement, there is a variation of the effect in melting iron. The greater the difference in the cupolas, the greater will be the variation in the melted product. Pig iron and coke merchants frequently find that two firms engaged in exactly the same line of work and using the same iron and coke, get very different results. Let us take as an example an experience which the managers of a certain foundry had with coke. They had used for a number of years a standard brand of Connellsville coke, and their cupola had been so arranged as to give the best results with this coke. The agents for another grade of coke, of a much lighter nature, finally persuaded them to try a car of their coke. After carefully ascertaining that a neighboring foundry was having excellent success with the lighter coke, they bought a carload. The first day it was used the trouble began and continued to such an extent that no more of that coke would be taken as a gift, and the last of the car was worked up, mixed with one half Lehigh broken coal. Upon inquiry, the cause of the differing results obtained by them and by the neighboring foundry, which was using the same light weight coke with such excellent results, was found to be this: In their own cupola the distance from the tuyeres to the sand bottom was but 11 inches, while in the cupola in which the lighter coke was being used so successfully, the distance was 20 inches. The tuyere area in the former was but one-half that of the latter, while the pressure in the former was greater by four ounces. This needs no explanation to one familiar with cupola practice.

Turning from coke to iron we find that the percentage of loss or gain of the metalloids or impurities varies with the height of tuyeres, size of bed, melting ratio, the size of the tuyere, pressure of blast, amount of flux, and the method of fluxing. When pig iron, in the course of melting, comes in contact with the blast, and is acted upon by it, certain of the metalloids are burned out of the iron. This is true in all cupolas. The amount burned out increases with the amount of air forced into the cupola by the blower. In the same cupola, and under the same conditions, irons varying in composition will lose different amounts of impurities. As the melted iron, freed to a certain extent from some of the metalloids, passes through the incandescent bed of coke or coal, it absorbs new impurities from the bed. The amount absorbed varies with the cupola practice. From a heavy or deep bed, other conditions being equal, more impurities will be absorbed than from a light or shallow bed. The temperature of the iron at this time has a decided effect upon the amount of metalloids thus taken up by the iron, as does also the amount of flux used. With a hot running cupola and a large amount of flux, little sulphur will be absorbed by the iron, while a large amount will come off with the slag.

There has been much discussion in the last year or two as to whether certain of the metalloids lose or gain in passing through a cupola. The great variation in the results obtained by reliable experiments has led to a general belief that there is no fixed rule which can be followed in figuring these cupola losses and gains. This idea, however, is incorrect, as I shall try to prove by taking up each metalloid separately.

Under ordinary conditions, iron melting in a cupola takes up sulphur from the fuel. The greater the percentage of fuel, and the greater the percentage of sulphur in the fuel, the greater will be the amount of sulphur absorbed by the molten iron. The ratio between the total amount of sulphur present in the fuel and the amount absorbed by the iron is dependent upon three conditions: first, the kind and quality of flux used; second, the temperature of the iron; and third, the composition of the coke and iron. A proper quantity of flux in a hot working cupola will take care of a considerable amount of sulphur. The sulphur present in the fuel as a sulphuretted hydro-carbon has no appreciable effect in increasing the percentage of sulphur in the melted iron. This accounts for the fact that many foundries melting with coal obtain castings with a lower percentage of sulphur in proportion to the amount of sulphur in the fuel than do foundries melting with coke. The greater the amount of manganese in the iron, the less sulphur will the iron absorb; and it is possible in cases of very high manganese iron for that iron to lose sulphur in melting; the sulphur passing off as manganese sulphide with the slag.

In passing through a cupola iron always loses in silicon. The amount of the loss depends upon two conditions; first, upon the amount of oxygen brought in contact with the metal in melting, and second, upon the composition of the iron as it goes into the cupola. In giving the amount of silicon lost in passing through a cupola, authorities generally mention a fixed amount. This may have been true concerning the grade of iron with which the writers were familiar. But it would be wholly untrue concerning other grades. The greater the amount of blast, the more silicon will be burned out. The higher the percentage of silicon, the greater will be the percentage of loss in passing through a cupola. By percentage of loss, I mean the ratio of lost silicon to the original amount of silicon in the pig. An iron running four per cent in silicon, will lose up to 24 per cent of its orginal amount, while the loss in an iron running .2 of one per cent is hardly perceptible. This variation in the loss of silicon is accounted for by the fact that the lower the percentage of silicon in the iron, the greater is the affinity of the iron for that silicon, and the more difficult will it be to oxydize it; while on the other hand, the greater the amount of silicon present in the iron, the less will be the affinity and the greater the amount oxnidized in melting. The percentage of carbon in the iron has a great deal to do with the loss of silicon in melting. This, however, will be taken up later under the consideration of carbon.

A very slight amount of phosphorus is absorbed from fuel by iron in melting. It is practically, however, a constant quantity, the small increase being proportional to the amount of phosphorus in the fuel.

Manganese loses in passing through a cupola. Its action is that of a protector from oxidation and the amount lost in passing through a cupola depends upon the amount of blast and also upon the percentage of sulphur in the fuel. The greater the amount of air forced into the molten metal the more manganese there is lost as an oxide. The greater the percentage of sulphur in the fuel, the greater will be the percentage of manganese passing into the slag as a sulphide. Manganese is not united with iron as a compound, it is rather alloyed with it, having practically no affinity for the iron.

I have left this element until the last for several reasons. Principally, however, because its action is understood less than that of the other elements which we have to consider in connection with melting iron. Carbon is really the life of cast iron. Various articles and papers have been written and much discussion has ensued in regard to the effect of melting upon the carbon in iron. Some say that it gains, others that it loses. If the founder is to be able to control his mixtures by chemical analysis, he must settle this question for himself. The articles written upon this subject are wholly misleading. In the early part of 1900, there appeared an article in "Machinery" written by J. E. Johnson, stating that iron lost carbon in remelting. This brought a reply from Thomas J. West in the following number, in which he contended that iron gained carbon in melting. Mr. West presented a record of the remelting of the same iron five times. In every case the iron gained in carbon. In a recent number of the "Foundry," W. J. Keep, in answer to a question, stated as a positive fact that iron lost carbon in passing through a cupola. These opposing statements from authorities on mixing iron, can but discourage anyone who is attempting to learn from the writings of others the changes which iron undergo in melting. A few weeks ago the following was referred to me by a foundry foreman. In order to determine the loss and gain in impurities in melting in his cupola he melted a quantity of No. 2 iron. He had the pig and the resultant casting analyzed and figured the differences. He then remelted some of the scrap from this heat alone. He had this iron analyzed and figured the change in carbon, etc. These two results were sufficiently conformative to allow him to figure that his cupola lost ten per cent of the carbon in remelting. Sometime afterwards, having occasion to make castings which required a very hard grade of iron, he had the e castings analyzed and found that instead of losing 10 per cent of the carbon, his iron had gained in carbon in passing through the same cupola. It was a case of Mr. West and Mr. Keep illustrated in the same foundry. In the experiment of Mr. West, spoken of above, an iron running below one per cent in silicon was used, and this iron gained in carbon. In Mr. Keep's stove plate work, iron running high in silicon is invariably used, and such iron will always lose carbon in melting.

Iron may both gain and lose in carbon in passing through a cupola, and whether the gain or loss predominates depends, first, upon the original composition of the iron; and second, upon the conditions or method of melting. An iron while passing down the cupola has a portion of its carbon burned off, the quantity depending upon the amount of blast and the time which the iron consumes in passing through that zone of the cupola where the oxpdzing influences are at work. After having a portion of its carbon removed, the molten iron comes in contact with the incandescent coke in the bed, and from this it absorbs carbon. The hotter the iron, the larger the amount of fuel, and the longer the iron remains in contact with this fuel, the more

carbon will it absorb. If the amount of fuel is sufficient, the iron may absorb more carbon than it loses in passing the tuyeres, and thus the iron will have gained in carbon. If, however, the blast is heavy and the ratio of fuel to iron small, the iron will lose more carbon in passing through the oxydizing zone than it can possibly pick up from bed, and thus the iron loses in carbon. Melting with low blast and high percentage of coke will cause a gain in carbon, while the high blast and low percentage of coke will cause a loss of carbon.

The original composition of the pig iron will have much to do with the loss or gain in carbon. An iron made at the blast furnace with a large percentage of fuel will be high in carbon. This if melted in a cupola with a small amount of fuel, will lose in carbon. While a pig iron low in carbon, made by a blast furnace using a small allowance of fuel, will, when remelted in a cupola with a relatively large amount of coke, gain in carbon. A low carbon iron, then, will tend to gain in carbon, while a high carbon iron will tend to lose in carbon in melting in a cupola.

There is one more factor which we must consider in discussing this loss or gain of carbon in cupola practice, and that is the effect or rather the relation of silicon to carbon in this process. I have said that low carbon iron gained in carbon. Let us now qualify this statement by saying that a low carbon, low silicon iron, will gain in carbon. Carbon and silicon, although they are analogous elements in many of their properties, have always been considered to be almost opposite in their action on cast iron. The facts of the case are, that their actions are almost identical, although the results are different. Pure iron we know will absorb carbon up to 6.67 per cent, while it will absorb silicon up to 23 per cent. One part of carbon then is about three and one-half times as effective on cast iron as is one part of silicon. We find this ratio to exist in our pig and cast iron to a marked degree. For every rise of 0.1 per cent in carbon in our pig iron made under the same conditions, there will be a corresponding decrease of 0.35 per cent in silicon, and vice versa. This applies in the same manner to our cupolas. When we melt a pig of say three per cent total carbon and one per cent silicon, we would expect under ordinary conditions, a gain in carbon. If, however, we melt a pig of three per cent carbon and four per cent silicon, we are sure, under the same conditions, to find a loss in carbon. Iron in the melted state may be thought of as a solution in which carbon and silicon each reduces the power of the iron to dissolve the other.

We have found then, that a small percentage of fuel, high blast, high carbon, and high silicon tend to cause iron to lose in carbon, while low blast, large percentage of fuel, low carbon and low silicon tend to cause iron to gain in carbon in melting.

When we consider the great variety of iron in use in foundry practice, and the divergency in cupolas, we can readily understand that no hard and fast rule can be laid down for all cases. Every foundryman must find cut for himself, in his own cupola and with the brands of iron which he uses, or else he must obtain his knowledge from someone whose experience is similar to his own.

Are our cupolas so arranged as to produce at the least cost, the best iron for our work? Are we, in order to save a few cents, running them with the least fuel possible, and paying out at the same time, dollars to obtain the superior grades of iron necessary when iron is melted with little fuel? Are we melting with heavy percentages of fuel, and then adding limestone to reduce sulphur, and steel to reduce carbon? Are we using high silicon to soften, when it is really high carbon that is needed, or high carbon when it may be that high silicon would answer the purpose very much better?

For various kinds of work, different grades of iron are required; stove plate and the like demand fluidity and softness, and to secure these an iron high in silicon, high in phosphorus, and rather low in carbon and manganese is most used. For light machinery, an iron high in silicon, medium in carbon and phosphorus and low in sulphur and manganese is necessary. Medium machinery requires an iron medium in silicon and carbon, low in phosphorus and manganese. In heavy machinery where weight rather than strength is desired, and where castings must be free from shrinks and segregations, iron low in silicon and phosphorus, high in carbon and manganese is essential, and a somewhat higher percentage of sulphur may be permitted. In castings where a high strength is desired, an iron low in silicon, low in carbon, low in phosphorus, low in sulphur, and medium in manganese is necessary. Cupolas then, should be so constructed as to best melt an iron suited for grades of it particular foundry.

The height of the tuyeres must regulate the manner in which the iron is taken from the cupola. Low tuyeres necessitate that the iron be drawn from the cupola as fast as it is melted, and either be held in a reservoir or taken away in small ladles. High tuyeres allow the iron to be collecting in the hearth of the cupola and to be drawn off in large taps, and have the advantage of allowing crane ladles to be shifted while the iron is collected in the cupola. When low tuyeres are used for filling crane ladles, if any time is apt to be lost in changing the ladles,

two spouts should be used. one ladle being placed in position while the other is filling. We have mentioned that for stove plate and like grades of work, a high silicon, low carbon, low sulphur and low manganese iron is best suited. We have also mentioned that the amount of carbon and sulphur which an iron will absorb is dependent upon the amount of fuel which it passes through. Hence for stove plate, and like work, the lower the tuyeres, provided they are consistent with good melting, the better suited will the iron be for the work. This does not interfere with the general practice in stove plate shops of removing the iron in hand ladles and by trolley tracks as fast as it is melted. Light and medium machinery castings require only a medium carbon percentage, and are much more advantageously melted in low tuyere cupolas. The somewhat lower silicon used in this line of work furnishes a higher carbon than is present in stove plate iron, and the small bed gives a low sulphur percentage. In the heavy machinery where softness and soundness are required, a large bed has an advantage. Low silicon irons which are cheaper may be used, and the carbon absorbed for the deep bed makes an iron high in carbon, while the resulting high percentage of sulphur is less detrimental in this heavy grade of work. The deep hearth allows the collection of a large amount of iron and thus makes the custom of tapping into crane ladles practicable. In the so-called strong irons, named by some gun iron, by others semi-steel, we have a somewhat more complicated problem. These irons must, first of all, be low in carbon and low in sulphur, and it is just such irons as these that absorb most readily carbon and sulphur from the fuel. There are cupolas in operation in many of our foundries from which it is practically impossible to obtain an iron above 28,000 pounds tensile strength for the reason the highest of the tuyeres requires so great a depth of fuel in the bed, that the iron will absorb an amount of carbon and sulphur so great that it is impossible to get a strong casting. For the melting of this grade of iron, low tuyeres are essential, and, of course, the iron must be removed from the cupola as fast as it is melted. The majority of cupolas in operation to-day have extremely high tuyeres, and we have seen that these are advantageous for but a single grade of work. In advocating the lower tuyeres for cupolas I have always met with the above mentioned objection in regard to changing the ladles in time to prevent the iron getting into the tuyeres. It is to obviate this difficulty that I suggest the double spout on cupolas which are so arranged as to make this possible. The modern tendency in building cupolas is to make the tuyeres as low as possible in order to show a high fuel ratio, and I venture to predict that they will be built much lower as soon as the double spout arrangement is more universally adopted.

The time has come when all foundrymen must unite in improving cast iron. There has been a tendency for each foundryman to keep to himself the results of his own investigation. This is no more than natural, but it has proved a short sighted policy. The fact that you can make a good quality of castings, is no excuse for allowing another founder, through his ignorance, to deprive the cast iron market of certain classes of work which an intelligent iron founder can supply as efficiently as can the maker of steel. There is a large amount of work now being made in steel which good foundry practice could have saved for cast iron. The engineer who has once been disappointed is not apt to blame the maker so much as the product, and so steel is specified where cast iron, through faulty practice, has failed. In its struggle to hold its own, cast iron must look to advanced cupola practice for its mainstay. Every branch of the iron business is advancing with rapid strides. Our foundries must wake up to a realization of these conditions. Engineers are more strict in their requirements of cast iron, while founders are drawing closer specifications round the pig iron furnace men. They in turn are constantly advancing, and I believe in spite of statements to the contrary that blast furnaces have never produced a better and more uniform product than they are producing to-day. The adoption of standard methods for analyzing and testing, the agitation for improved grading, prove the steady progress of those branches which are vital to future foundry success. Let us then look to our cupola practice, and see to it that in the general progress the very heart of our foundry is not neglected.

For your Buffalo convention last year, I wrote a paper urging an advancement in foundry metallurgy, suggesting that time which was being spent on worn out topics be devoted to a study of advanced metallurgical conditions. With this thought in view I have studied the various cupola conditions most needing attention, and have presented to you a few of the conclusions at which I have arrived. I have again endeavored to clear away some of the disagreements which fill foundry literature, and if I have at all succeeded, let me once more ask you to press forward in this investigation, remembering that the very existence of the cast iron foundry depends upon its meeting the advancement of steel with advancement of iron, the cheapening of steel with the cheapening of iron, and the improvement in steel with improvement in iron

The Effect of Melting Steel with Iron in the Cupola.

By H. E. DILLER, Chicago, Ill. [Presented at the Boston meeting of the American Foundrymen's Association.]

IT is well known that melting steel with iron in a cupola adds strength to the resultant casting. But to what degree this is so, and the best proportion of steel to use are not so clearly understood. With a view of learning something more definite in regard to these two subjects; and also to see if it were possible to trace some connection between the percentage of total carbon in the iron, and the tensile stength, I have made the tests given in the accompanying table.

The tensile and transverse strength given, are the average of two, and in some cases three, test bars. For the tensile strength a 1⅛ inch round bar was used. The transverse strength was obtained from a one inch square bar placed on supports 12 inches apart.

The objects sought in the following classification is to have the silicon about equal in the tests of each set, the amount of the other elements being as nearly alike as it was possible for me to get them.

Tests Nos. 1 and 2 show comparatively little difference in the chemical contents, except in the manganese and graphite. As the manganese in No. 1 should be beneficial to the strength of the bar, the only way to account for the greater strength of the iron from No. 2 is the lower percentage of graphite, or the molecular structure resulting from the 25 per cent of steel in the mixture.

Comparing Nos. 3 to 7 we find that the strength increases with the percentage of steel used, and the decrease of total carbon with the exception of No. 7. In this 37½ per cent of steel was used, and the total carbon was less than in any other test, but it is weaker than either No. 5 or No 6. This being a solitary case it can hardly be used as proof that 3½ per cent of steel is more than it is well to melt in a cupola. But test No. 11, which also contained 37½ per cent of steel and more carbon, was only a little stronger.

Test No. 4 was considerably weaker than No. 5, but its higher percentage of sulphur with its lower combined carbon would seem to indicate that these bars were either cooled slower, or poured from duller iron than were the bars from No. 5, which may account of their being weaker than the No. 5 bars.

In looking at Nos. 8 to 11 we see that No. 9, although containing 12½ per cent of steel, is no stronger than No. 8, in which there was no steel. And No. 10, with 1.06 combined carbon, and 12½ per cent of steel, gives less strength than might be expected. As these tests are so much lower in manganese than Nos. 8 and 11, it may be that their weakness is due either to the lower manganese or to the conditions of melting, which reduced the percentage of manganese so much more than in Nos. 8 and 11. The four charges each contained about .50 manganese before melting.

Nos. 13 and 14, each from charges containing 25 per cent of steel, show a marked increase in strength over No. 12.

We find that all the tests from charges containing 25 per cent of steel are stronger than those from the charges containing but 12½ per cent, with the exception of No. 5, which is stronger than two of the tests which had 25 per cent of steel in the mixture.

The tests were made with pig iron, ferro-silicon and steel scrap, no cast iron scrap being used. This was done in order to better control the percentage of the elements in the iron.

In some cases when a large percentage of steel was added, it was necessary to use ferro-silicon to get the desired amount of silicon in the charge. To see how this and the steel mixed with the pig iron, two tests were taken from No. 13, which contained 1,000 pounds of steel, 400 pounds of ferro-silicon (8.5 per cent silicon) and 2,600 pounds of pig iron. The charge was tapped from the cupola into a ladle, and the tests taken at different times, as the iron was being poured from the ladle. The one sample contained 2.53 and the other 2.54 per cent of silicon.

Two tests taken in the same way from No 14, contained 1.97 and 1.94 per cent of silicon. This charge was made up of

No.	Silicon	Sul	Phos.	Mangan	Comb. C.	Graphite	Total C.	Tensile Strength	Transverse Strength	Per Cent of Steel
1	1.43	.047	.564	.82	.67	3.14	3.81	23060	2550	0
2	1.50	.045	.532	.33	.64	3.44	3.08	30500	2840	25
3	1.76	.0[illegible]2	.488	.53	.51	3.12	3.63	221[illegible]0	2140	0
4	1.76	.139	.515	.57	.43	2.94	3.37	[illegible]7090	2770	12½
5	1.77	.059	.339	.4[illegible]	.56	2.87	3.4[illegible]	32500	3120	12½
6	1.83	.100	.610	.55	.51	2.44	2.95	36860	3280	25
7	1.75	.089	.598	.35	.74	2.12	2.86	30160	3130	37½
8	1.96	.104	.446	.44	.6[illegible]	3.18	3.81	21950	2230	0
9	2.12	.037	.410	.26	.38	3.26	3.64	21890	2470	12½
10	2.16	.060	.3[illegible]5	.20	1.06	2.30	3.36	26310	2670	12½
11	1.97	.093	.470	.48	.57	2.83	3.40	32530	3050	37½
12	2.3[illegible]	.061	.515	.[illegible]6	.54	3.40	3.94	21990	2200	0
13	2.53	.104	.490	.54	.60	2.56	3.16	33390	2850	25
14	2.36	.064	.327	.24	1.08	2.15	3.23	31560	3200	25

1,500 pounds steel, 450 pounds ferro-silicon, and 2,050 pounds of pig iron.

Similar tests from charge No. 2, which wa

made up of 1,000 pounds steel and 3.000 pounds pig iron, contained 1.50 and 1.52 per cent of silicon.

These three cases offer pretty strong proof that the pig iron, steel, and ferro-silicon mixed thoroughly.

Although of a limited number, the tests given seem to indicate that 25 per cent of steel will add about 50 per cent to the strength of the iron; and 12½ per cent of steel, approximately 25 per cent. The tests containing 37½ per cent of steel were hardly as much improved in strength as those with 25 per cent of steel, from which we may infer that the limit of the amount of steel it is beneficial to melt with iron in a cupola, is between 25 and 37½ per cent.

Cast Iron.

By PERCY LONGMUIR, Manchester, Eng., [Presented at Boston meeting of the American Foundrymen's Association.]

THE term "Cast Iron" embraces iron possessing widely different properties. The pig iron of the chemist and the cast iron of the founder are, of course, synonymous terms, cast iron being to all intent and purposes remelted pig. Generally speaking, cast iron may be regarded as metallic iron, associated with varying amounts of carbon, the content of which is seldom lower than two per cent. In addition to carbon there are always greater or less amounts of silicon, manganese, sulphur, and phosphorus present in every variety of cast iron.

Other things being equal the mechanical properties of any variety of cast iron depend upon the amount of these constituents and the relations they bear to each other. This combination may be such as to favor the production of a high quality iron, or it may be such as to produce one that is poor. High and low quality are terms of convenience rather than of exactitude, and every iron produced is applicable to some definite purpose for which its quality may be regarded as good.

In reviewing the constituent elements of cast iron the foremost and most important in effect is that of carbon. Though it can hardly be said that the presence of any one element definitely rules the quality of cast iron, yet this element closely approaches his position. In a large measure it is the amount of carbon present in any iron that determines its quality and the purpose to which it is adapted. With average grades of cast iron the total carbon present varies between 2 and 4.5 per cent. This latter amount is exceeded in certain alloys such as ferro-manganese or ferro-chrome, but these are instances distinct from the cast irons. The actual occurrence or mode of existence of carbon in iron is to some extent a controversial matter. To the founder, however, who must necessarily keep on the practical side of science, carbon is known in two conditions, these are as free carbon or graphite, and combined carbon, or iron and carbon in a state of definite chemical combination.

Cast iron, whilst fairly strong in compression, is weak in tension. Apart from other contributory causes this low tenacity may, to some extent, be explained by the distribution of the free carbon which is familiarly shown in a fractured sample of pig iron. The flakes of graphite or free carbon when the cast iron is in tension, act as isolating media, and a series of these little cuts, as it were, offer a convenient route along which fracture may readily travel. With a compressive force these conditions are not so evident and consequently cast iron is well adapted to resist crushing forces. Naturally a high content of free carbon denotes a soft iron, but it is the amount of combined carbon that regulates the quality of any iron and determines its suitability to meet any specific purpose. This relationship of carbon and iron is shown to best advantage with the steels, and in all steel works practice a given content of carbon denotes that steel to be applicable to a certain definite purpose. For instance, a steel of razor quality would never meet the conditions required from one of "axle" or "tyre," temper and vice versa.

Hence standards have arisen which in the case of ordinary iron carbon steels are of almost universal recognition. These may be briefly summarized as follows:

Class of Steel.	Content of Carbon.	Purpose.
Bessemer	0.20 per cent	Plates, Sheets, etc.
Bessemer	0.25 per cent	Axle steel.
Bessemer	0.30 per cent	Tyre steel.
Bessemer	0.50 per cent	Spring steel.
Open Hearth	0.20 per cent	Boiler plates.
Open Hearth	0.65 per cent	Spring steel.
Open Hearth	1.30 per cent	Tool steel.
Crucible	0.90 per cent	Chisel steel.
Crucible	1.10 per cent	Large files, drill, steels.
Crucible	1.20 per cent	Turningtool steels.
Crucible	1.40 per cent	Saw file steels.
Crucible	1.50 per cent	Razor steels.

The utility of carbon standards so well shown in the foregoing table unfortunately cannot be carried to the same exactitude in the case of cast irons. But recognizing combined carbon as the controlling factor the following four percentages give approximate representations of the quality denoted by that percentage.

Content of Combined Carbon	Variety of Cast Iron.
0.10 per cent.	Dead soft.
0.20 per cent.	Soft
0.50 per cent	Highest tensile strength.
0.70 per cent	Highest transverse strength.

These figures relate of course to irons of normal qualities. The difficulties in fixing exact carbon standards for cast iron are great, owing to the complex character of the metal and the high content of elements other than iron.

From carbon to sulphur is a fairly natural step owing to a relationship often wound between these two elements in a series of ascending irons produced from a similar grade of ore. Sulphurous irons, apart from other drawbacks are generaly speaking "hard." This hardness and the relationship just spoken of may be found in the fact that high sulphurs usually accompany high combined carbons. A glance at the following series of ascending irons will illustrate this feature:

	Number of iron						
Combined	1	2	3	4	5	Mottled	White
Carbon	0.50	0.60	0.80	1.10	1.30	1.80	3.00
Sulphur	0.02	0.02	0.04	0.08	0.11	0.15	0.20
Silicon	2.50	2.30	1.80	1.50	1.20	0.70	0.30

When producing iron in the blast furnace the lower temperatures favor the production of sulphurous irons, high in combined carbon and correspondingly hard" or "white". These conditions are intensified if the slag be strongly acid, and are restricted if much manganese be present, sulphur in the latter case combining with the manganese, forming a slag of manganous sulphide. These conditions are interesting to founders in that the cupola furnace bears certain analogy to the blast furnace.

With the cupola slow melting, accompanied by a low temperature, yield conditions which favor the taking up of more sulphur from the coke than is the case with quick working at high temperatures. An interesting increase in sulphur resulting from three remeltings is shown below, which, by the way, is not given as representing first-class melting practice.

	1st melt	2nd melt	3rd melt
Sulphur %	0.04	0.10	0.20

Phosphorus appears to have little effect on the combined carbon, and in a series of ascending irons this element usually remains fairly constant. To some extent it lightens the appearance of a fracture and has a slight hardening effect on the iron with which is it associated. From a foundry point of view phosphorus is not nearly so harmful as sulphur, and is less of an evil to the iron founder than the steel maker.

Phosphorus in cast iron promotes soundness, increases fluidity, and with it the capacity for taking and retaining the sharpest details of a mould. Castings such as machine details, gearing and the like, which have a fair amount of shock to resist, may contain up to five per cent phosphorus. However, the general run of castings may contain up to 1.5 per cent, but higher percentages than this are only advisable for castings in which strength is immaterial.

Manganese increases the capacity of an iron for carrying carbon and by permitting the formation of double carbides of iron and manganese increase the hardness according to the content present. This hardening effect is, however, neutralized in the presence of high silicon.

Iron and manganese combine in proportions up to 80 per cent of the latter, the product being the familiar ferro-manganese. With lower amounts of manganese, that is between 12 and 20 per cent, the product, is known as "spiegel" or "spiegeleisen."

Manganiferous pig irons are specially useful in foundry practice for mixing with others contaminated with an excess of sulphur. In this manner manganese may act as a softener, that is by effecting the removal of sulphur. Generally manganese increases the hardness and closes the grain, and hence is valuable in castings that have to be finished up dead smooth. With an iron in which silicon and sulphur are normal, from 1 to 1.50 per cent, manganese will do all that is desired. Of this quantity a certain amount will be oxidized, which, varying with furnace conditions may reach a total of 40 per cent.

Silicon is present in every variety of cast iron, and owing to its effect on the formation of combined carbon has been conveniently regarded as a ready means of controlling the quality of an iron. Silicon acts indirectly as a "softener" by producing conditions which favor the precipitation of carbon in the graphite form, and, other things being equal, results in an iron, the softness of which depends upon the extent of this precipitation. Hence the silicon contents of various irons offer ready means for the adjustment of mixtures, and consequently there have arisen silicon standards. In general practice these standards cover the percentages of silicon from 0.5 to 2.5 ranging from castings such as cylinders and valve bodies down to soft castings, pulleys and the like. The influence of silicon on cast iron has been very fully investigated by Professor Turner, of Birmingham University, in England, and by W. J. Keep, of Detroit. The following table is a summary of Professor Turner's results:

	Content of Silicon per cent.
Cast iron yielding maximum hardness......	0.60
Cast iron yielding maximum crushing strength	0.80
Cast iron yielding maximum	

density in mass	1.00
Cast iron yielding maximum crushing, tensile, transverse strength	1.40
Cast iron yielding maximum tensile strength only	1.80
Cast iron yielding maximum softness and general working qualities	2.50

The utility of silicon standards is shown in the foregoing table, and for general purposes a mixture figured on the content of silicon alone will give a reliable result. But it must be remembered that silicon acts indirectly, and that it is the combined carbon that rules the destiny of any iron. The relationship of silicon and combined carbon are shown in analyses quoted earlier in this paper.

Very briefly the elements present in every variety of commercial cast iron, have been mentioned and in addition to these already quoted the number may be increased by the designed or accidental presence of other metals, such as aluminum, copper, titanium, chromium, etc. Therefore the simplest variety of cast iron is necessarily of a complex character, the physical properties of which are dependent on the relationship these constituents bear to each other.

Of these constituents there are never less than seven present, or if we regard cast iron as a single metal, contaminated with foreign elements we then have a body of iron associated with greater or less quantities of other six dissimilar bodies. That is to say iron is the matrix, and through this are distributed—as fruit through a cake—the other ingredients. Questions naturally arise as to the mode or manner of this distribution. Does the element in question penetrate the iron evenly and as an element?—if so my illustration of the fruit through a cake is inadmissable. Or is the element distributed in patches, as an element, through the iron? That is to say, do particles of iron, particles of manganese and particles of sulphur exist in contiguity, and as free elements? With the one exception of graphite, practical experience would not confirm such a supposition. On the other hand do the elements form definite compounds with portions of the iron in which they are held, and in the cold solidified metal exist as definite chemical compounds? A further point also occurs under this head, and that is as to the manner in which enormous physical changes are produced by the presence of exceedingly small amounts of foreign matter—sulphur forming a familiar example of this effect of traces. These and like questions lead one into a maze of scientific theory and speculation. Therefore the following fragmentary jottings are merely suggestive, and not in any sense conclusive.

In viewing the seven constituents that together form cast iron, it is evident that one, graphite, does exist in a state of freedom—that is as a form of carbon pure and simple. It has a mechanical effect as shown earlier, and it produces softness in the iron indirectly by reducing the amount of carbon available for combination. Graphite, therefore, having only a mechanical effect, can only act within fairly well recognized limits. But it requires no great stretch of imagination to realize in part the latitude in character offered by the remaining six constituents. Carbides of iron and manganese, silicides of iron, sulphides of iron, or of manganese and phosphides of iron interspersed through free iron offer a range of latitude, varying according to the degree of the penetration of the iron by the compounds. In this manner the effect of mere traces may be followed. Sulphur in suitable combination with iron or manganese in the form of a brittle sulphide, will occupy an area out of all proportion to the minute quantity of free sulphur originally present—the trace thus becoming enormously multiplied, and its effect carried to a far greater extent than any possible by the element in its free state. The energetic effect of small amounts of combined carbon may be accounted for in this manner and with an increasing content of carbon a greater distribution of the carbide occurs and yields a degree of hardness proportionate to the amount of carbide present. It is evident, however, that a point must be reached at which saturation occurs, that is to say, when the iron has combined with as much carbon, phosphorus or other element as it can hold—the intrusive compound then penetrating the whole of the metal and corresponding with the disappearance of free iron. That this is the case has been very clearly and forcibly demonstrated by Professor Arnold in his exhaustive researches on carbon on iron.

Further thoughts are also suggested in that each of these carbides, silicides, phosphides and sulphides possess varying co-efficients of contraction—that is to say, the compounds will crystallize according to their degree of fusibility and therefore crystallization may extend over a wide range of temperature. Conversely, on heating, the more fusible compounds will naturally be the first to soften and liquify. Therefore, at temperatures far below solidification point there may exist within the frozen metal pasty or semi-pasty particles of a readily fusible compound. Founders who have observed pig iron melting a the hearth of a reverberatory furnace or an ingot of brass in a crucible, will have noticed on exudation of these fusible compounds before the liquefaction of the pig or the ingot.

There must be then within a mass of cast iron containing, say, 93 per cent iron and seven per

cent of other constituents. many conflicting forces, and the question arises at what temperature is an equilibrium established. It is evident that in large castings these internal forces are intensified by the unequal cooling from outside to center. and that in a mass so cooling each rise of temperature towards the interior will represent a more or less distinct state of strain, but as the outside crust freezes, the internal strains are imprisoned and the question again arises when is an equilibrium established.

These thoughts are of interest chiefly in the case of castings which are employed in positions in which temperature plays a part. It is within every day experience that occasionally a casting successfully treated hydraulically will fail when put on steam trial. May not this failure be due to the presence of compounds which are affected by the temperature of the steam? Imagining for one moment a solid consisting of several dissimilar ingredients distributed with more or less regularity through a common matrix, and we have a fair idea as to the structure of solidified cast iron. On the application of heat an expansion occurs and the more fusible areas distributed through the iron begin to soften and so destroy the continuity of the mass, rendering it liable to rupture by shock. Assuming that the temperature be too low to soften these compounds, but that it be sufficiently high to modify their structural arrangement, we then have a possible explanation as to why in certain cases a casting will resist a definite pressure applied by means of cold water, and yet will leak on a similar trial by steam.

Temperature and pressure seriously affect the working life of any casting, but generally speaking iron castings are not subjected to extremes on either hand.

Further than this it is usually the custom to design castings of greater bulk than that theoretically demanded in order to secure stability. This excess of bulk forms in most cases a reliable factor of safety, allowing the casting ample margin to efficiently meet the usual working conditions. It is of course abnormal results that direct attention to the possible combination of the constituents of cast iron in either beneficial or adverse forms.

The writer had hoped to illustrate this paper by a few micrographs and typical cast iron, but regrets that the available free time precluded this.

The Molding Machine.

By H. S. STUPAKOFF, Pittsburg, Pa. [Presented at the Boston meeting of the American Foundrymen's Association.]

FLASKS.

TALK to a foundryman about flasks and you will touch another sore spot. No wonder, for flasks are a continual drain on the exchequer. Founders will tell you that if it were not for the cost of flasks, there might be some profit in the business. They admit that they are a necessity, but invariably think them an unavoidable nuisance, a source of constant annoyance, loss, and expense, in fact. the greatest evil of the foundry. It is often thought that every cent spent on the construction and maintenance of flasks is just so much money thown into the gutter.

But luckily, all the opinions on this subject do not run in the same direction. There are many founders who have gone through it, who hold and prove that bad flasks give bad results, are false economy, and point to poor judgment. They argue, and justly so, that money spent judiciously for a good flask equipment, especially for a good set of stock flasks, and a liberal sum set aside and used for their maintenance, is a good investment. An expenditure of this kind is mainly a matter of first cost, and is fully justified by the results.

The founder who knows a good thing when he sees it, will also know how to take care of it. He will not permit his flasks to be abused and thrown out into the yard where they are exposed to the deteriorating effects of the weather. He will keep them under roof and guard them against all possible damage. Nobody will question the fact that bad flasks are more than likely the principal cause of loss of time and of castings. Yet how many are there who will anxiously try to save and stint in this direction? Give your molder good material, good facilities, and above all let him have good flasks, and you have a right to expect a good day's work, and that of good quality.

Good flasks are especially important in machine or plate molding. In fact, to insure good results from molding machines, the flasks used must be practically perfect. They should be constructed so as to insure a firm holding of the molding sand. They should be made stiff, light, and durable. The flask pins should be accurately fitted. If flasks are made in sets, they must be absolutely interchangeable. When copes and drags are put together they should not rock or shake sideways. The pins should be firm and square with the flask surface; and while they

must not bind on the other hand they must not fit too loosely.

Ordinary shop-made wooden flasks, such as are used in most foundries, are not likely to give good results in molding machine practice, but if carefully and substantially made, and perfect in all other respects, there is no reason why their application in machine molding should be absolutely condemned.

Iron flasks are always preferable, more especially because they do not shrink, warp, or get out of joint. Pressed steel flasks, if they could be procured, would answer still better. If wooden flasks are used, they should be provided with an iron ring, at their face, which ring should serve not only as a tie and alignment, but also as a base for securing the flask pins.

Turned tapering flask pins give the best satisfaction in flasks for machine molding. Part of the pin is usually turned down to a square shoulder with a thread at its lower end, the cylindrical portion is fitted into a corresponding hole in the flask lug and permanently secured thereto by a nut. A better way is to ream tapering holes in the flask lugs, make the lower ends of the pins accordingly and drive them lightly into place. Thus, a few pins will answer for any number of flasks, as they can be removed as soon as the flasks are closed and clamped together. Greater care can thus be bestowed upon their production, as the increased cost is but a small item, and when not in use they can be easily removed from their sockets and bolts, flasks and pins can be easily and properly taken care of.

A convenient way to remove such taper shank pins is shown in Fig 12. A piece of flat iron or a flask clamp is used as a lever by placing it between the lower end of the taper shank and the

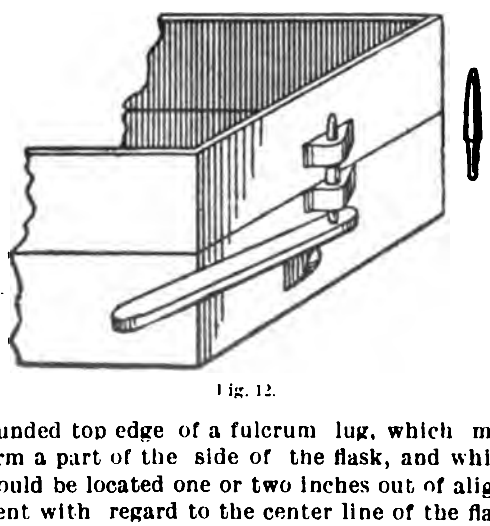


Fig. 12.

rounded top edge of a fulcrum lug, which may form a part of the side of the flask, and which should be located one or two inches out of alignment with regard to the center line of the flask pin. A prolongation of these lugs may also form the handle of the flask. A slight pressure or a light tap with the hammer will loosen the pins from their sockets, whereupon they may be easily withdrawn. The B. & S. Standard is recommended as the most suitable taper for those taper shank flask pins. Accurate reamers are always obtainable in exact duplicates, and their use insures absolute uniformiy.

It may not be out of place to caution against the maltreatment of the ends of these flask pins, which is bound to cause trouble and annoyance. There is not much likelihood to injure the pins if mallets of either rawhide, wood, lead or copper are used for driving them in or out. As an additional precaution, to protect them from injury it is desirable to have them case-hardened. Care should be taken that the flask pins do not spring or bend during the hardening process; if they do, this fault should be corrected before they go into service, for bent or sprung pins are unfit for use. Little or no trouble will be experienced with good tool steel pins.

It is common practice to arrange the flask pin lugs in such a manner that a space of about a quarter of an inch or more is left between them when the flask is closed. Thus, no attention need be paid to the small quantity of molding sand, which inadverently collects and packs around the base of the pins while the flask is being filled, but which would otherwise form an obstruction in the closing up of the flask. These spillings must be removed if the faces of the lugs are on a level with the parting edge of the flask.

It is sometimes troublesome to close or open flasks which are provided with well-fitting round flask pins as molding sand or dust will unavoidably adhere to them. This difficulty may be overcome to a great extent by removing a portion of the cylindrical part of the pin by either flattening or grooving as shown in the cross section, Fig. 13.

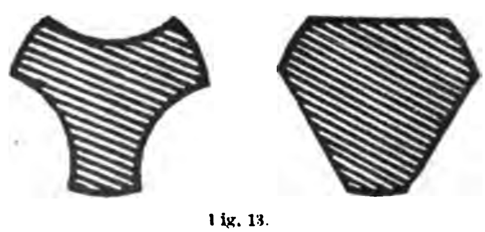


Fig. 13.

Constant use of flasks of this kind will eventually wear out not only the flask pins, but also the sockets of their corresponding mates. They cannot possibly be kept absolutely clean, and the sand will keep on cutting until the defect must be remedied. It is an easy matter to exchange the worn out pin for a new one, but it is not so easy to correct the fault in the flask pin socket, unless, indeed, it was provided with

a removable bushing in the first place. This, when necessary, can be replaced with the same facility as the pin. This is a point but rarely observed. To get perfectly satisfactory service out of a flask, it is nevertheless quite as important a matter as all the others which were mentioned above.

The makers of molding machines are undoubtedly very well aware of all the requirements, which are covered by the observance of these little details; they will appreciate their importance and must admit that they are essential to make their machines a success. Yet, to my knowledge these facts have never been mentioned. Is this information kept from the founder purposely, that he may not be scared from the purchase of machines? If he should be told all this be might in the first place think of the expense, and next that his molders cannot get used to refinements of this kind—which, by the way, is not a very creditable opinion. But, if be buys one or more of the machines offered he cannot help finding all this out before long to his own chagrin. By that time, perhaps, he has made up his mind to throw the thing in the scrap pile, or, if he persists, because he knows that others have succeeded, he will be compelled to pay dearly for his experience. He could have had this experience in the first place, and at a reasonable price, had he been furnished not only with the machine, but at the same time with jigs, sample flasks, pins, etc., and above all with necessary information to which he was justly entitled.

It should be taken into consideration, that not all founders, foreman and molders are expert engineers or machinists, nor can they be expected to be fully versed in all the intricacies of machine design, mechanical laws and movements. To convince them, and to demonstrate that machine molding is superior in every respect and more economical than the process of hand molding, in which line they themselves are experts, they need all available assistance and must be taught from the very beginning the principles of the construction of the machines, the scope of their utility, their application and the importance of accessories, and the essential parts in all minor details. Many failures to introduce the molding machine into foundries, to establish and to maintain their reputation as labor savers can be traced to the lack of intelligible instructions sent with them by their makers, and be it intention or neglect, the withholding of this information does more or less harm to all parties interested, and retards the world's industrial progress.

The Molding Machine.

By S. H. STUPEKOFF, Pittsburg, Pa. [Presented at the Boston meeting of the American Foundrymen's Association.]

JIGS.

THE deduction arrived at in the foregoing chapter might make it appear that plated patterns are not likely to find an extensive use in jobbing foundries, whereas this is really not altogether the case. There is no doubt that plate molding in its present shape, or rather as ordinarily applied, is practically excluded from jobbing shops. But, if a plate is used in connection with a suitable jig, specially prepared for the purpose, objections are not only overcome, but the application and use of plates offer excellent advantages even in such cases where only a small number of castings of the same pattern are required at one time. At best, the economic use of plated patterns is limited by the shape and size of the castings. The fundamental principle involved in their construction and application must be fully understood by the user, if satisfactory results are expected.

Irrespective of its relations to the molding machine, it would seem that this subject—on its own merits—is of such importance, that it should be investigated by all foundrymen. It should specially interest the majority of our members. I have therefore somewhat enlarged the scope of this treatise on the molding machine by including a detailed study of the construction and modus operandi of this particular contrivance.

To begin with, it should be understood that all plates are provided with guide-pin holes,

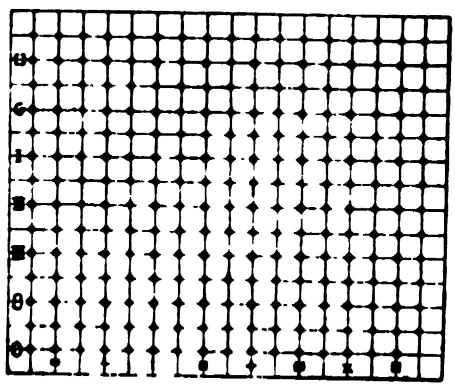


FIG. 9

which are accurately fitted to corresponding guide pins forming part of the flasks. Unless special flasks are used in connection with such plates the customary flask pins should not be

confounded with these guide pins, as they will never answer the purpose. In order that misconceptions in this respect may be avoided, this term will be adhered to in what follows, and strict distinction will be made between flask-pins and guide-pins wherever they may be mentioned in the course of this work.

The guide-pin holes, G. and G^1, Fig 9, are preferably arranged on opposite ends of the plate, in even multiples of an inch, and equi-distant from its center and on a line dividing the plate into two equal rectangles. There are exceptional cases, in which three or four guide-pins must be used. The most serious objection against this arrangement is the greater difficulty experienced in locating the patterns correctly.

Accuracy in preparing the plates becomes of the utmost importance, as the magnitude of all errors occurring in the original laying out is doubled by each subsequent operation. The guide-pin holes should be drilled and reamed out at right angles to the surface of the plate, and it is advisable to provide them with hardened and ground steel bushings. All guide-pins should be of uniform diameter irrespective of the size of the plate. A pair of test pins should be kept on hand, which snugly fit the guide-pin holes: one half of one of their ends should have been cut down to about three quarters of an inch in length, leaving as remainder exactly one-half of the cylindrical portion. (Figure 7.) If these test pins are inserted into their respective holes and a straight edge be placed against their flattened faces, it will serve for locating the base or the center line of the plate, for marking off and laying out the dowel pin holes, arranging the patterns and checking off all work relating to it.

The exact location of the center of the plate, and likewise the center of the flask, is found by dividing the base line from center to cente guide-pin hole into two equal parts. Let us drill a hole C in this place, (fig. 8) and let this hole serve as the starting point for future operations. Now we will assume that we have procured a tri-square with a row of holes drilled in each of its legs; these holes are spaced equally—say one inch apart—care being taken that each row stands exactly in a straight line, and that both rows include an exact angle of 90 degrees. We place this square in such a manner on our plate that the hole in its apex corresponds with the centre hole C of our plate, and insert a good fitting dowel pin through both. Thus we are

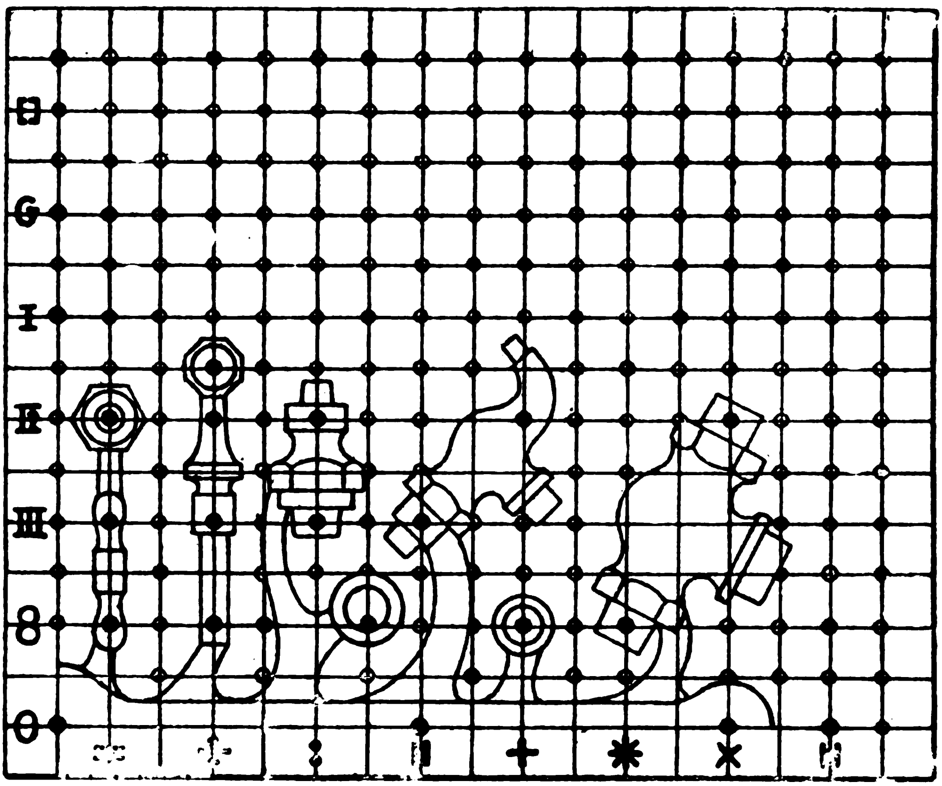


Fig. 10

able to shift the square over the whole surface of the plate by turning it round the center pin. Next we bring one leg of the square over the base line of the plate and insert a second dowel pin (which may be shouldered if necessary) through G into the corresponding hole of our square. Secured in this manner the square should be absolutely rigid and should not shake to right or left on the surface of the plate. We now drill one hole each into the plate through the guides H and I of the square, then we remove the pin from G, turn the square around the center pin over 90 degrees, so that one of its legs points upward and the other one to the left, insert a dowel through the hole in the leg pointing upward into the top hole I^1 of the plate, and drill the hole H^2; finally we turn it again over 90 degrees, secure it in the same manner

ings. The pilot holes in connection with the center hole will serve us hereafter as guides for locating pattern dowels.

Our object in view is to use this plate as a base for any and all suitable patterns, and as an illustration we will arrange it for the reception of patterns of globe valve and a bib cock. We will assume that the patterns are all in good shape and properly parted. However, they shall originally not have been intended for use with either molding machine or drawplate. Our plate and flask are of a suitable size, but the job is in a hurry—as all jobs are—and we must get out quite a number of these castings to-day. What are we going to do about it? Take my advice and make it in the old fashioned way, unless you are provided with a suitable jig plate and an inexpensive, but a good small drill press, which was

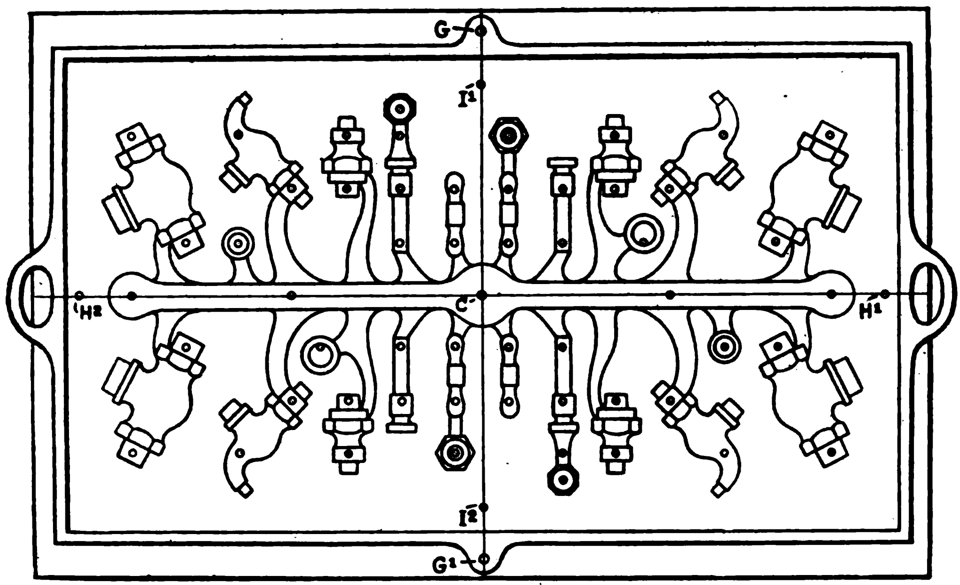


Fig. 11.

; before, and drill the hole I^2. Figure 8 il-
istrates the square in the first position as locat-
l on the plate; the holes H^2 and I^2 which are
rilled subsequently, are shown in faint lines.
'e shall call these holes, in the future, "pilot
oles," in order to distinguish them from others
the same plate. These four pilot holes in-
ude an exact rectangle or square, and each op-
osite pair is located at uniform distances from
e center of the plate and flask. It will be un-
rstood that it is not absolutely necessary to
nploy the square for drilling the pilot holes.
r instance, after one plate has been prepared
this manner, this plate can serve as a jig
r drilling any number of additional plates in
e same manner by a single setting. Such an
iginal or master plate is especially serviceable.
all holes are provided with good steel bush-

never used by your blacksmiths or yard laborers, but was expressly reserved for this purpose only, was always under the care of a mechanic who understood how to handle it, and who took pride in keeping it in good shape.

This jig plate (fig. 9) should be provided with a number of holes, two rows of which, at least, are drilled exactly in the same manner as those in the above mentioned square; the balance are laid out preferably, but not necessarily so, in straight and parallel lines, all equi-distant from each other. Its dimensions should be sufficient to cover one corner, or one-fourth of your pattern plate.

If these things are part of your equipment you will have easy sailing, and you will be better fitted to tackle the job than your competitor.

Place this jig in such a manner in one corner

of your draw plate that the hole O (fig. 9) corresponds with the hole C in its center, hold both together with dowel pins inserted into the pilot holes, and drill the holes through the jig into your plate, which are required for securing the patterns in the predetermined places. To avoid mistakes be sure that the hole in that particular corner of the jig, which corresponds to the one described as located in the apex of the square is distinctly marked on both sides of the jig plate—in our figure marked O—and note carefully which holes in the jig were used for drilling the dowel holes into the pattern plate. Thereafter turn the jig upside down on the pattern plate, insert the dowel pins again through the same holes O and OI into C and I^1, and the third one through OH into H^2, and then, as before, drill through the same guide holes of the jig the corresponding dowel holes into the second quarter of the pattern plate. Repeat the same process at the lower half of the plates being always careful that C and O remain together and the plate is ready to receive the patterns.

That there may be no doubt as to the method of operation, I suggest that you will refer to the two plates which are attached hereto. In faint lines thereon is shown the outline of the position of patterns, which corresponds to the arrangement of the same on the pattern plate (Fig 11.) Horizontal and vertical lines, which are provided with identification marks cross all the holes in the jig plate. The holes which are to be used in this special case as guides for drilling the necessary dowel pin or screw holes in the pattern plate are indicated by circles drawn in heavy. Thus, the holes II×and 8* are used for securing the globe valve body pattern, II+ and III|| for the body of the bib cock, and so forth. By placing onion skin paper in this way over the drawing of the pattern plate, that its hole O corresponds with the center hole C of the latter, and OI and OH respectively with I^1 and H^1, it will be noticed that the outlines representing the patterns cover each other in both cuts. The jig placed in this position over the pattern plate, and secured to it by the pilot pins at O, OI and OH is used in this manner for drilling all dark lined holes in the right hand upper corner of the draw plate. This being done, the pilot pins are withdrawn and the jig plate is reversed and turned into the upper left hand corner of the pattern plate, just as if it were hinged at the line OI, the pilot pins are replaced into the same holes of the jig as before and in this position they will secure it to the pattern plate by entering its pilot holes C, I^1 and H^2. It will be observed that in this position also, equally well, the outlines of the patterns in both cuts fall exactly together. The jig is used in this position as before, the guice holes which were used in the first position in the upper right hand corner serve again as guides for drilling the second quarter of the pattern plate. Identically the same process is then repeated at the lower left hand and lower right hand corners of the plate, by first turning the jig plate around the imaginary hinge center OH. and then around OI.

In order to prepare the patterns to suit the above conditions, we proceed exactly in the same manner, by securing one-half of each separately, and always the one which has the dowel holes, at the previously determined place on the jig plate and drilling clear through them the holes which coincide with those drilled previously into the pattern plate. The second halves of these patterns are then placed in position against the first (drilled) halves; they are prevented from moving sideways by their original dowel pins, and they may be held together by suitable clamps. These clamps are preferably made of a universal type which adapts them for use with all kinds of patterns, their lower portion being constructed in the shape of a frame which rests on the table of the drill press without rocking and which is adapted for fastening the patterns in such a manner that their parting faces stand parallel to the drill table. The half of the pattern which has been drilled first with the aid of the jig occupies the upper position in this clamp or drill frame, and the holes in this one will now serve as guides for the drill to drill the holes in the second half which stands directly underneath. Finally have the original dowel pins of the patterns removed and fasten all parts separately in place on the pattern plate by either dowels or screws, or both, which ever may be preferable and most convenient in your particular case.

If I may call your attention again to the drawings, you will observe that we have prepared the pattern plate in this manner with four complete sets of patterns; yet, we have used only two. The castings resulting from the use of these plates should be perfect as to match. The amount of labor required to withdraw the patterns from the sand is reduced to a minimum, additional time is saved by the use of a stationary gate or runner on the plate, and double the quantity of castings can be produced in this manner with the same number of patterns and in the same number of flasks. All this can be accomplished by making an effort of no longer duration than it took to describe.

If you have followed the above description carefully, you may have noticed that it is not necessary to have an individual plate prepared for each set of patterns. Yet I thought it better to describe this method of preparing pattern

plates and patterns for plate molding in detail than to leave room for any doubt or error. You can easily see that much of the time which it apparently took to get the plate and patterns ready for the molder, can be saved by providing the entire surface of the plate with dowel holes before putting it into use. This should be done with the aid of the jig and in identically the same manner as has been sufficiently explained in the foregoing. Thus, only new patterns have to be prepared for the purpose, and all others, which once have been fitted, are easily replaced and secured to their correct positions on the plate, providing their dowel holes were promptly provided with specific numbers, letters or identification marks. The additional holes in the plate will not impair its working qualities, but they could be easily closed up with bees-wax if objectionable. Finally, it is well worthy to note that each plate can be used in connection with all patterns within its range, and that it can be kept in continuous service, while the patterns may be changed at will, and as often as desirable.

While the above description may appear somewhat too extended, I assure you that a serious mistake would have been made had the subject been slighted merely for the sake of brevity. At the same time I will say in justification of my apparent digression, that my original subject has not been sidetracked. At first sight, it may appear, that the construction and the manipulation of pattern plates has but little connection with molding machines, but I hope that I will succeed in showing in the course of this work, that they are not only intimately connected with each other, but that they are in fact the principal parts of all molding machines. The lack of intimate knowledge of how to make use of them to the best advantage, the want of proper means to effect this purpose and the wretchedly little effort which is made to catch the right spirit of their nature is generally the reason why the molding machine becomes an elephant on the hands of a molder and an eye sore to its owner.

FIG. 7.

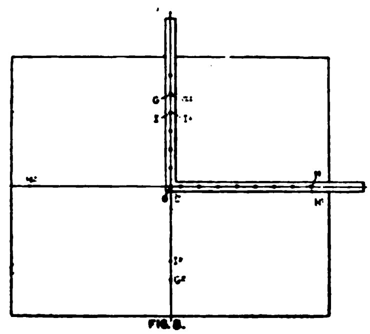


FIG. 8.

Cores and Core Arbors.

By EDWARD B. GILMOUR, Milwaukee, Wis. [Presented at the Boston meeting of the American Foundrymen's Association.]

IN the upbuilding of our language it has been customary to give names to the things pertaining to science and art, such that on hearing them mentioned, a good idea of them is obtained even though they have never been seen. Thus in foundry practice we ask what does a founder "found?" From this comes the subdivision into iron founder, brass founder, etc. Similarly the world "mould" conveys the idea of shaping something into a particular form as may be wanted. In speaking of cores one naturally recalls the well known quotation from Shakespeare, "Give me the man that is not passion's slave, and I will wear him in my heart's core."

The core is a very important part of a mold, but in a great many cases is dismissed with the idea that all that is wanted is simply to ram sand in a box to the shape desired, and you have the core. This may be so, but unless the core is properly vented, that is, proper channels provided for the exit of the gases that are generated while casting, the result will be a bad casting. The gases will be forced through the surface of the core and blow the iron out of the mold. In many cases the core will go to pieces, and so you will readily see that coremaking plays a very important part in the production of good castings.

Cores are made in different ways and with various materials. The usual method is to dry them, for when a core is thoroughly dried there is less liability of anything going wrong. There are other cores that are used "green," that is, not dried, and must be made of a different material from that used for the usual dried core. When a boy goes to work in the foundry for the first time he is taught the art of core-making, beginning with very small cores, afterwards branching out into the larger ones. This is the first work of molding, and all good molders are, as a rule, good coremakers.

It is usually the practice to make a core-box of the final shape desired, but in many instances

room in order to have the two half cores pasted together.

In making cores for straight pipes, such as water pipes, they are usually made upon core bars, or spindles as they are termed. Sometimes these bars are cast hollow with holes dispersed all over them, in order to allow the gases to escape when casting. For small pipes ranging from three to four inches in diameter, a round, solid bar is used with grooves or slots running from each end so as to serve for the air passages. These bars are usually revolved by power, the bars having trunions on each end which fit into a bearing box. A cap fits over them so as to keep the trunion in place when in motion. Hay ropes are wound around the bar, and afterwards common black mud is swept over the ropes. This is termed the first coating. Thereafter the

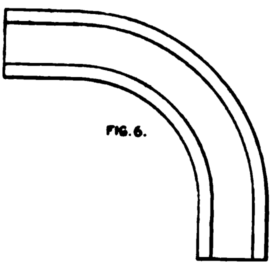


FIG. 6.

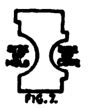


FIG. 7.

core runs upon a double rail into the drying oven and keeps revolving slowly through it to the opposite end. It is taken out by the man who puts on the finishing coat. He in turn rolls it upon the same double track into another oven and it follows the same process of drying. When completed it is taken out and gets a coat of blacking while it is still warm.

I might go on and give a great many methods of making cores and core arbors, but the same in core making as in sliding one has to be guided by judgement, experience, and circumstances, as to what promises to be the best method to adopt. The number of castings required must also be considered so as to be sure that whatever method is adopted that it will pay. It is here that the specialist gets in his work and produces castings at phenomenally low costs. This can, hwoever, only be done when a quantity is one of the main factors.

The question is often asked what size of outlet should be given in venting cores. The best practice is to get it as large as possible, for the larger the cutlet the less liability for the passages getting closed. It has been maintained that an opening of one-eighth of an inch area is large enough for a cubic foot of core. I have in some instances had a smaller opening proportional to the size of the core, for a vent passage, but it is not always good practice to have such small passages. When the outlets are very small it is not good policy to put many cinders into the cores as the more cinders present in a core, the more gas is generated. It is in cases of this description that the designers of castings can materially help to simplify work in the foundry, and if they were more conversant in foundry practice there would be more sympathy and respect for the molder, on account of the many difficulties he has to overcome.

The kind of material commonly used in venting cores is cinders. These are the best and the cheapest, and have a tendency to steady the pressure of the gas when generated, and allow it to pass off very easily. The arbors in the cores also make an excellent vent, for when the core is dried the heat in drying expands the rods and causes a continuous space throughout the whole core. In very sharp points in cores it is good practice to simply put plenty of rods without any vent passages whatever so the rods will be sufficient and are more safe.

Some Methods of Increasing Foundry Production.

By DAVID REID, Biddleford, Me. [Presented at the Boston meeting of the American Foundrymen's Association.]

THE success or failure of a foundry manager does not depend on his ability to give a correct chemical analysis of the material he uses, nor his ability to figure for his employer almost unheard of ratios in melting iron with coke, nor yet in his own unquestioned ability as a molder. The combination of the three, however, go a long way in contributing to his success in this "Progressive Age" of ours.

It is a progressive age, as we must all admit, with its development in the arts and sciences. In our own industry, the molding machine has taken gigantic strides, though still almost in its infancy. From a business standpoint, this is also an age of competition that is keen and sharp at all times, and at periods becomes so bitter as to be criminal in its effects, and necessitates the intervention of the law.

Competition is healthy to any business, when carried on in a fair manner, and it is at the present time when you are in the market for work that the production is of the most vital importance, for apart from the cost and sometimes taking precedence even over this, the question of delivery will often determine who shall have the contract.

Right here is where a manager makes or mars not only his own future, but possibly that also of the firm, for on his ability to turn out the maximum production at a minimum cost with

the men and room at his command, lies the whole secret of success.

During the past year, we have received through our "Journal" splendid articles on various topics that incidentally touch on this matter of increasing production, prominent among which is the article on "Molding Machines" by S. H. Stupakoff, of Pittsburg. The molding machine from the plain and exceeedingly cheap but useful press to the latest creation of the automatic, "which does everything but pour the molds," is the greatest factor the founder can use to increase his production, whether he is in the specialty or the jobbing line, and in the article referred to above, the writer has handled this subject in such a very able manner, that I simply endorse his statements, and draw your attention to some very good advice he gives at the end of one of his papers.

Sometimes, a foundry, while equipped with all the modern appliances for turning out work, finds itself unable to live up to its contracts, and the following method was employed in one, which, though not modern in all its equipment, yet competes successfully with those that are, in the general, light machinery work. Being part of a large plant for the manufacture of light machinery, there came a time when the other departments were compelled to run night and day, with the natural result that the foundry, already taxed to its limit, was unable to keep up the work for the machine shop. Part of the work was therefore given to another foundry in order to help out. This was most unsatisfactory to every one, except the other foundry, and the manager adopted the same system, with modifications, as the machine shop, namely two crews of molders, machine operators and laborers.

The day crew began work at 5.30 a. m. and worked till 5.30 p. m., with one hour for dinner, receiving 12 hours as compensation, while the night crew started at 5.30 p. m.. and did not finish till 12.30 or 1 a. m., getting pay for 8 hours. The crews changing about every week, payments being made every two weeks, their average time was 10 hours daily. On Saturdays the men started one-half hour earlier, to avoid Sunday work.

Previous to this arrangement, the men had been receiving three hours extra as a premium for additional work, while the two cupolas, one small remodelled McKensie and a large one of the same type, were supposed to be at their limit, giving in two heats 27 tons of a melt daily.

In the writer's opinion, the doubling of this amount of iron melted, which was accomplished and even exceeded at times, is the most creditable part of this method of increasing the production. The small cupola was used in the forenoon, being timed to drop bottom at 11.45, and bringing down a melt of 12 tons. Five hours later a laborer "chipped" it out getting it ready for the melter and his assistant, who after eating their supper had this cupola ready for the blast at 9.30 p. m., when a second heat of 17 tons or over was melted in the one cupola, making a total of 29 to 30 tons every 24 hours from a cupola rated by the builders at four tons per hour.

The main heat of the day was in the large cupola, which seldom went under 27 tons, this being arranged to get through at 5.30 p. m., there being one section of the shop that worked 10 hours straight.

This system of increasing the production was carried on most successfully for a period of seven months, until business became normal again, and at the end of that time the foundry was nearly three months ahead of the machine shop, which is an exceedingly good thing to have during the time for labor agitations of various kinds.

As stated before, the cupolas used were of the McKensie type and the height from bottom plate to bottom of charging door was only nine feet. The daily consumption of fire brick used in patching was only eight on an average for the entire period of seven months, when the small cupola was relined to the charging door.

How about the molding sand you would ask, and my reply is that this was taken care of by pouring the front of every floor that was to be used at night, in the first or morning heat, and having laborers take out the castings and wet the sand. When the balance of the work was poured and dumped, that sand was placed one side leaving the coals and ready to be used by the night crew.

In regard to the cost per pound of producing castings by this method, though not at liberty to give exact figures, I can assure you, that it was less than the six months preceding, when the men were receiving premiums.

R. C. Cunningham in his paper on "Foundry Costs" brings up a point that gives a glimpse at the possibilities for increasing production by the division of labor where it belongs. The steel works and some of the specialty foundries have to a great extent solved this problem, and in the recent conference of the Iron Molders' Union and the Stove Founders' National Defense Association, it was recognized by the molders that the general trend of industrial development is in employing skilled labor, so far as practicable, at skilled work. I am willing to predict that in the future, and how near for you individually, depends upon your managers to a great extent, that every molder without reference to the class or charactor of

the work, will do nothing but produce, leaving the pouring, the dumping up of work, the cutting and mixing of the sand, and all other laboring work, to unskilled labor.

When you reach the point where the molder starts in the morning to practice the art at which he has served a number of years' apprenticeship, and continues at that work all the time he is being paid for, then and not till then, will you have solved the problem of the greatest production at the lowest cost.

A number, how large I do not know, of you here to-day, run jobbing and general machinery foundries, and I venture to say that certainly 95 per cent of your molders stop when the blast goes on, whether it gives them six or seven hours of molding time, and as all cannot pour first, the greater part of your crew are waiting their turn and doing nothing.

What matters it if you insist on their staying in the foundry till the whistle blows, do you gain anything by it, except the moral effect it has on the other departments, which of course is no small matter?

You might ask how the molder would take to this system and though they appreciate the efforts in this line, in the stove foundries where it is all piecework, yet in machinery work, might it not cause trouble? Having a large number of molders working under this division of labor principle, I can say that they are perfectly satisfied and think it the finest scheme yet devised, as they have no pouring or dumping to do, thus eliminating the hardest and hottest part of what formerly constituted their work.

The only objection, that comes from any one, is in regard to the pouring crew. But obstacles are encountered only to be overcome by the ambitious, and the men who do the pouring may be only laborers under the direction of a molder, trained for that special work as you would train them for the molding machine. Or if you prefer it, they can be culled from your apprentices with the addition of a molder or two as leading hands, while a large majority of your molders keep the cost where it belongs by producing molds.

The dumping and cutting over the sand in the machinery shop where this system is in vogue, is accomplished by means of a night crew of laborers, 15 in number, who take care of the work of 120 men, in 12 hours.

That the pouring requires a certain amount of skill, is granted, for on that often depends the quality of the work, yet we have an instance right here in old New England, where laborers, trained of course, pour up the entire amount of work put up by the molders in a foundry handling nearly 2,500 different patterns in a week, the weight in the casting varying from an ounce to 275 pounds.

The immediate result of this method of increasing the production was the saving of one day's wage all around, as the same amount and over in fact, was produced in five days, where before with the same crew it took six.

Economy.

By P. R. RAMP, Schenectady, N. Y. [Presented at the Boston meeting of the American Foundrymen's Association.]

ECONOMY is something that is essential in carrying out a business of any kind. The foundry business is no exception to the rule, and at no time is there an opportunity for so much thought and study along this line in our industry than now.

In our efforts to cut expenses we sometimes begin at the wrong end, and as the old saying is, "We spend a dollar to save a cent." During my experience as a foundryman, I have heard many men express their views as to cheapest methods of production.

While I have often been able to profit by suggestions, I have listened to some arguments which were amusing. In order to produce good work, work that must come up to given specifications, we must use good material. I have a personal dread of cheap blacking, cheap foundry flour, poor molding sand, soft coke, poor iron, etc.

A poor grade of material can be purchased for nearly one half the cost of a better and more suitable article. Yet it is generally economy in the end to purchase the best, as the reduction in loss of bad castings will in many cases exceed what is gained by the reduced price of the cheaper material. The following are some of the materials that are often brought to our notice as something that can be bought cheaper and will save us money. For instance a foundry flour at one-half what the regular supply is costing us, yet when a carload is received we find it is necessary to use about twice as much as we take of the old flour to do the same amount of work. This is detrimental in more ways than one.

In making cores or dry-sand molds, the more flour is used in the sand mixture, the more gas there is generated. And the more vegetable matter that will produce an excessive gas, the greater possibilities there are for a cut, scab, or a blow, which results in a bad, or dirty casting.

The greater the amount of flour we are forced

to use in order to make strong cores or molds. the more they will swell while drying. This causes them to vary in shape and size.

Another item is "plumbago," "blacking" or "dry sand facing." We may be paying four or four and one-half cents per pound for a lead that is doing good work and pealing the castings in a very satisfactory manner, when along comes a "supply man" and induces the purchasing agent to buy a carload of a cheaper lead, say for two and one-half cents per pound. This lead, he will probably say, is used by several large concerns, whose product we know is all that could be desired. Here is where an impractical man is lead astray. He does not consider what quality of sand the parties referred to are using behind this lead, perhaps this is a good open sand that would do the work nearly as well without any lead or facing. We try this lead on our work, our sand is close and contains matter which promotes the formation of gas, and this creates in the molted metal an uneasy motion while it is being poured and after the mold is filled before it solidifies. This action of the iron causes additional wear on the surface of the mold and the cheaper grade of blacking will wash and rise to the surface, thus producing a dirty casting.

Poor molding sand is a great draw back. I have in mind a firm that obtains a very poor grade molding sand from a supply house some 200 miles away, when better sand could be dug within one mile of the shop. The only objection is, this good sand cannot be shipped in carload lots, but must be hauled by wagon loads, which is really preferable as it is an easy matter to reject the wagon load of poor sand and receive a better grade from the same wagon an hour later. But 'tis no small job to be compelled to work up three or four carloads of inferior material.

Poor coke causes much trouble. I know of a large concern in the West who use a very cheap grade of soft coke for melting purposes because it can be purchased at about $3.00 per ton less than good 72 hour coke would cost. They claim a saving in this method, but it is my belief that if they should consider the extra time consumed in melting and the castings that find their way to the scrap pile on account of dull iron, they would realize that there is more economy in using a good grade of coke.

The same is true where one blower is used to furnish wind for two cupolas, and the capacity of the blower is but little more than is required for one cupola. This makes it necessary to put the blast on at say 12.40 or 1 o'clock, and with two cupolas, one 60 inches and one 80 inches diameter, it is a good job to melt 60 tons by 5 o'clock, which means 15 tons per hour for two cupolas. Now, if an independent blower were used for each cupola, with the proper tuyeres location, the time consumed in melting could be cut nearly in half. This would make it possible for the molder to work up till 3 o'clock p. m. at molding instead of beginning to pour off at 1 o'clock, which would mean two hours more. This would in a short time pay for several new blowers.

When we refuse to give our molders good flasks and good patterns to work with in order to save, we often lose more in bad work than it would take to build new patterns and flasks, to say nothing of the delays caused by failures of molders to make good work which may be directly traced to poor rigging.

To those who have always considered the building of flasks an unnecessary expense, and have practiced the most rigid economy in regard to them, I want to say that good molders are hard to get and expensive. In shops where the proper appliances cannot be secured, they are hard to keep. But if we make the equipment of the foundry a personal study, and build our flasks, patterns, etc., in a manner that will simplify the work regardless of first cost, the question of good molders will be settled. With all conditions as they should be and the work and methods made easy it is possible to develop good molders out of what men we have in our own shop or even out of men that have never handled a rammer or shovel. I would prefer the latter as I believe there is much more economy in teaching a green man how to mold and paying him for scrap castings for a couple of weeks, and later receiving a fair day's work from his floor the year around, than there is in compelling a molder who has worked at the trade all his life to work in a different manner than he has been accustomed to.

The idea of economy with reference to pattern making is in some cases a delusion. For instance it is more expensive to give a large gang of men one locomotive cylinder pattern and have them ram and finish two or more a day, than it would be to make two or more patterns and let them make one a day each. Two molders will accomplish more in a day than one half of what four men will accomplish on the same job with only one pattern. Besides this, much better work is the result of placing fewer men on the job. Hence where we have a number of castings to make in a rush it is cheaper to build an extra pattern than to crowd too many men on one pattern.

In making iron flasks for locomotive cylinders it is economy to make separate flasks for the different sizes, where there is any great variation. It is false economy to try to use one large flask for all sizes. The reason is plain enough. On the small ones the same amount of labor is

required to ram it up as on a large one when one large flask is used. And in drying the mold double the amount of fuel and time is required, to say nothing of the danger of the large body of sand sagging and causing the mold to loose its proper shape.

There are many other things that could be mentioned which cause much waste, such as insufficient dry sand and core oven capacity, crooked core plates, improperly constructed patterns, system of handling melted iron, casting, sand, flasks, etc.

The different items I have made mention of in the above are not new to foundrymen. Although we all realize that these things help to increase the costs of production, there are many foundries to-day where just such conditions prevail.

Brass Melting.

By CHARLES VICKERS, Chicago, Ill. [Presented at the Boston Meeting of the American Foundrymen's Association.]

COMPARED with steel or iron, it is an easy matter to melt brass. On a small scale, it is frequently melted in an ordinary heating stove, or on a forge, (in the latter case, however, a temporary furnace must be formed of brick, and the crucible coked up therein.) Such crude methods though, are suited only to the amateur, or where a small breakdown job is needed in a hurry by some firm not having the ordinary melting facilities.

When brass is melted on a large scale, the furnaces are a very important part of the plant, and it pays to do considerable thinking and figuring before building them. The character of the castings to be made, must always influence the size of the furnace, as small furnaces are much more economical for the production of small and light castings than large ones. This is a thing not always considered however, so that it is a common sight to see a "30" pot put into a furnace intended for a "100". The coal dealer may never kick at this, but his debtors often do at the size and frequency of his bills.

Here then is one point in brass melting, whatever the size of the furnaces, three inches of solid fuel around a crucible will do as much work as six, and is more economical in fuel, labor and metal.

The fuel saving is apparent without a thought. The labor saving requires a little more effort to perceive. We must consider the extra shovelling and "poking down" required by the larger furnaces, while as to metal saving, some people may not see that point at all unless it is explained. Therefore, the larger the fuel surface, the greater the heat thrown towards the furnacemen when he removes the cover, and the greater the temptation to stand away off, and "peg" the metal at the crucible when the foreman isn't looking.

Some melters become quite expert at hitting the crucible, and most of the metal charged, finds its way therein. But they can never overcome the splashing when a chunk drops into the liquid contents of the pot, and most of these splashes are lost in the fuel, and they are metal. So this is bad practice, and generally costs more than the loss of fuel. Another little point to be considered in economical melting, is never to charge up a pot unless one is reasonably sure that the molds are going to be ready when the metal is, because it costs money to "hold" a plot in the furnace, as is frequently done. Then again the much abused crucible will wear away as much as or even more, when only half filled than when filled.

And still again, never build or allow your furnace to become "barrel shaped," high-faluting theories to the contrary notwithstanding. A straight wall is always the best.

So far as we have gone with these remarks, no particular style of furnace has been recommended as being better than others, because most brass-founders have their own theories in this respect and although they may differ in minor details, most solid fuel furnaces bear a general esemblance to each other, so much so that there is another defect so serious and so universal, that lots of good strong language might with advantage be used thereon.

Not that there is any intention of using strong language here, we will leave that in the shop mixed with the gas that causes it, and in a few mild words explain the trouble, and suggest a remedy. As before mentioned, this trouble is caused by gas, the products of combustion being too often driven into the shop, polluting the atmosphere to such an extent that the health of the human beings employed therein is seriously endangered. For molders are human beings, although some people seem to doubt it and think that anything will do for people employed at such dusty, dirty work.

Many founders imagine that when power is applied to furnaces it is impossible to carry off all the gases, and so it is, with flues adequate for natural draught, but when the air supply to a furnace is increased by the application of a fan

beneath the fire the flue area must also be increased, unless the same was abnormally large before the fan was applied.

So if there is gas in your shop your flues are too small, the remedy is to enlarge them; do not go to the trouble of cutting holes in the roof or to the expense of placing ventilating fans, which you will find are failures so far as removing the gases is concerned. And right here let me impress the fact that it is not always the main flue which is faulty; most founders make this generous in size; turn your attention to the flues connecting each furnace to the main flue. Your foreman may pooh pooh the idea and advance all kinds of theories to the contrary, but do not listen to him, he needs educating on this point and see that he gets it, or get a new foreman.

There is no evading the fact, that if a flame is driven from beneath the covers of furnaces, the products of combustion are being driven into the workshop instead of through their proper channels into the outer air where they are harmless. In place of driving air through a furnace, in some few cases the fan has been placed in the flue and by exhausting the air therefrom creates a strong draught through the flues, the furnace being operated the same as natural draught, that is with open ash pits.

With this system a high chimney is not necessary, and the atmosphere of the shop is entirely free from contamination by the product of combustion. It possesses one disadvantage to carless people, and that is the flues and their connections must be kept in good condition. Should they be permitted to fall into decay, the melting capacity of the furnaces would diminish in proportion to the air leakage.

For this reason, unless exceedingly well built, brick flues are not so well suited to this system as are iron ones, because the average brick flue, built by the average brass melter or his foreman, is never built so well as the poorest bricklayer would do it, and consequently rapidly crumbles under the racking effects of expansion and contraction.

When sheet iron is used for brass-furnace flues, they are best when made circular in form, with rectangular cast iron connections to each furnace; the main sheet iron flue must be suspended and not allowed to touch a wall or any non-conductor; if the air has free access to it the flue will rarely become red hot, and will consequently give good and economical service.

If the heat radiated from the flue troubles the melter, which it probably will, do not sheathe it in asbestos, or you will soon have nothing but an asbestos paper flue and a poor one at that, but hang a curtain of asbestos in such a manner as not to touch the flue, but still shield the melter.

Foundry Costs.

By R. C. CUNNINGHAM, Holyoke, Mass. [Presented at the Boston Meeting of the American Foundrymen's Association.

AT the annual meeting of the American Foundrymen's Association held in Buffalo a year ago, I presented a paper on "Foundry Costs." The ground I took at that time was that we were doing a large amount of work in our foundries which only increased our costs and did not increase our production, this unnecessary work being due to badly made and worn out patterns. The article was severely critized by pattern-makers and others in trade journals and by personal letters. One man went so far as to say that the principal reason that foundrymen were not consulted more in the construction of patterns, was that very few could tell by looking at a drawing how a pattern should be made, and during his 25 years' experience as a pattern maker he had only met one foundryman who could read drawings intelligently. It was claimed that the paper had a tendency to create a bad feeling between foundrymen and pattern-makers and there would be constant wrangling as to how patterns should be made. I certainly had no intention of saying anything to be little the pattern-maker or to provoke discord in any shop. I made the statement at the time only in the interest of the foundrymen, and I feel to-day that I am backed by large majority in what I said.

Shortly after the convention I had an occasion to visit a prominent concern. In conversation with the manager he told me that he thought my paper would do good, and wanted me to go through his works and tell him just where he could save money. He further added, "I think we are about up-to-date, but am willing to learn." I went into his foundry and in observing things my attention was attracted by a molder standing apparently waiting for something. While I was watching him the workman next to him passed him over his rammer. He took it and went to work. Upon investigating I found that these two molders had only one rammer, one shovel and one No. 4 riddle. Neither had a fine riddle, brush, pail or bellows-nor in fact any of the tools that are usually furnished by the company. They had quite a number of helpers in the shop. They did not give each of them a shovel. I spent the greater

part of a day about the shop carefully observing the way the place was managed and I think I am safe in saying that 10 per cent of the men did not have proper tools to work with and depended on borrowing from the other men or upon what they could pick up about the shop.

As I was leaving the manager called me into his office and inquired if I saw anything I would have different. I told him I though there was some things that could be improved upon. He wanted to know what they were. I told him of the things I saw in the shop. He thanked me and said "I will look into it and I will write you." This happened about 10 months ago. I had forgotten about it when a few weeks ago the following came to me:

"You will remember spending a day at our works several months ago and of expressing yourself upon how you found things in the foundry.

"The next day after you was here I went into the foundry to find out the truth of your statement and I will have to admit you did not half tell it. I went into the foundry and stayed there over a week and I will say candidly I do not see how the men could do as much work as they did. In a few days every man had his supply of tools marked with his number. I stopped the molders waiting around in the morning. I had all their patterns and flasks on their floors by seven o'clock. I have the flasks fitted before the job comes into the foundry. The molders work no harder than they did before, but were turning out more castings and they are much better. Our expenses remain about the same, lower if anything, which shows a reduction in the costs.

"The statements you made in your paper before the American Foundrymen's Association last year were facts. Our foundries are neglected. We should pay the same attention to them that we do to our machine shops.

I sincerely hope you will give us another paper on the same subject this year."

This letter comes from a man who thought his foundry was up-to-date, and I have no doubt that there are many more of the same mind. Now I wish that every foundryman present at this convention, when he returns to his own home would go into the foundry and do as this man did, stay there a week or a month if necessary (it is a good healthy place to stay) and just take notice of the patterns that come into the shop and see if the molders have the proper rigging.

See that there is no waiting for anything. Give your molders a chance and you will be surprised at the results. Now I wish every foundryman present to-day would try this and at the end of three months write me the results, no matter what they are I would like to know how you found things in your shops. Those of you who are about your shops daily have no doubt seen and corrected every thing of this kind found there. but those of you who walk through your foundry only occasionally are the ones that I want to take this to heart and bear in mind that the little annoyances are where the time is lost. They may seem small in detail but are large enough in the aggregate to increase the cost of your castings. The time when we can get more than a fair day's work from a man has gone by and to-day every foundryman must keep close watch on his costs and production or he will find the balance on the wrong side of his ledger. In my opinion his only hope is to devise ways to do his work with more unskilled labor. By doing this he will not be dictated to, but will have a chance to get more benefit of his brain work than is now accorded to the employer of skilled labor.

There is one fact that we must not close our eyes to, and that is that the tendency of organized labor is to keep the production down to the lowest possible point, and at the same time increase the minimum rate of wages. Now with these cold facts staring us in the face we must watch very carefully and see that no work is done that we get no returns for. An hour or two spent on a badly made or worn out pattern means an increase in our cost, and does not increase our production. and in order to overcome this we must figure and scheme to have things so that the molder can turn out more work. It is an increase in our production without any increase in your cost, is what we must aim for. To do this we must study every pattern, and if we can, by making changes, make a mold any quicker, we should not delay a single day in doing so.

I want to give you one illustration on this point. We have at our works a pattern for a 16-inch steam piston ring. During the past 25 years the company has made thousands of these rings. They were molded in the usual way. The pattern was made about one inch wider than the casting wanted, to be able to secure it on the face plate while turning. The ring is then cut off the desired width, and cut into four segments. The actual cost of labor on one set of these castings when they were ready to put into the cylinder, was 75 cents. The casting in the rough weighed 23 pounds. The finished casting weighed seven and one-half pounds. The waste piece cut from the ring, that went into the scrap, weighed six pounds. Nine pounds went into turnings. I expended $3.75 on a new pattern and plates, and am now putting these same castings into the erecting room for four cents a set, besides the saving on the iron. I am saving 71 cents on labor on each set of castings. The

Company makes probably 500 set of these rings a year, including the new work and repairs. The saving on this job alone amounts to over $350. A half dozen jobs like this could pay the salary for a good man for one year.

I do not claim that every job can be put on a machine on plates and the same results obtained, but even if we can get an increase in our production of 25 per cent without any increase in our expenses, it is certainly worth trying for. Our company has put on during the past year over 200 hundred different patterns on plates, and on none of them have we made anything less than 50 per cent saving. Any foundryman is welcome to come and inspect our patterns. We have no secrets about our shop. What we have learned by experience we are willing you should profit by if you wish.

An amusing incident happened at our works a short time ago. A foundryman was visiting our shop and I was showing him this same pattern which I have mentioned here. After locking it over carefully he said: "It is a very fine idea, but I fail to see where you get any credit for it. According to your own statement you have cut down your production about two-thirds, now, unless your firm does different from any other you only get credit for what castings you turn out, where you formerly got credit for 23 pounds of castings, now you only get credit for seven and one-half pounds. It looks to me as if you were helping the machine shop at the expense of the foundry." I told him I was working for a firm that gave credit where it was due, and I think that every company should let their men understand that any improvements gotten up to reduce the costs or increase the production would be liberally paid for. It should be the aim of every foreman to encourage this among his men, particularly among the younger class. There is nothing that encourages a young man as much as it does to ask his opinion. We must remember that from among the young men we are to find our future foundry managers, and when they take the burden from our shoulders let us have the satisfaction of feeling that we exercised our ability to its fullest extent in filling up those dangerous pitfalls and removing as far as possible the stumbling blocks from their paths.

The Foundrymen's Convention.

The seventh annual convention of the American Foundrymen's Association convened Tuesday morning, June 17 in Huntingdon Hall, Boston. After the usual addresses of welcome and response, Dr. Richard Moldenke, secretary, presented his report showing increased membership principally from Holland, Germany, England, Scotland, showing interest being taken throughout the world in American foundry practice. Treasurer West's report showed cash $253.98: expenditures $2352.61. The auditor's report stated that large sales of the association's standardized drilling, had been made during the year and that work is becoming more important, especially where disputes arise concerning accuracy of individual work.

Committees on the standard methods of determining the constituents of cast iron, and standard methods of sampling of pig iron grading of pig iron by analysis, made full reports. The report of the committee on a foundry trade school was presented bringing up much discussion. Many suggested that the association act at once in establishing such a school. Messrs. Seaman and West mentioned that the proposed erection of the Carnegie technical school, Pittsburg is to have a foundry department, and spoke of having the proposed trade school established there. The Pittsburg Foundrymen's Association has had the matter up with Secretary Conway and proposed aiding him in having a foundry built and operated under modern methods. A new committee will be expected to aid in having the subject brought up with the school authorities.

Other papers presented were, "Method on the Insuring of Patterns," Frederick Colin, South Bethlehem, Pa.; "Reduce the Apprentice Period," E. H. Putman, Moline, Ill., Dr. Richard Moldenke presented a paper on "Proper Valuation of Pig Iron for Foundry Purposes."

Standard specifications for steel castings as adopted by the American Association for testing material were presented.

OBITUARY.

JAMES OTIS WATSON—James O. Watson, Sr., the pioneer coal operator of West Virginia, died at his home Fairmont, W. Va., June 12 aged 87.

James Otis Watson was born in Marion county, near Fairmont, in 1815. He received a liberal education and in early life entered the mercantile trade, with which the combined agricultural pursuits.

The climax to the efforts initiated by Mr. Watson and extended by his sons and other operators, was reached June 18, 1901, when the organization of the Fairmont Coal Company was effected, the result of the efforts of C. W. Watson, the youngest son of J. O. Watson, this corporation having a capital of $12,000,000.

Producing Capacity Taxed—The Ironsides Company, Columbus, O., advise us that its latest acquired additional specialty—The Ironsides Improved Patent Tormay Oiler is being rapidly adopted by the principal plants of the country, and that the general demand has taxed its facilities.

Strike Danger Passed Safely.

The threatened strike of the foundry molders of the Pittsburg district was averted by a settlement made at Old City last ... last week by which the men get a considerable advance in pay, though not what they asked for. During the week several conferences were held. At the first meeting no agreement could be reached. Matters, however, adjusted themselves gradually and the founders agreed to pay an advance of 6¼ per cent with a minimum rate of $3 per day.

The molders met in Old City hall, June 13, to consider the proposition. Some were in favor of rejecting it and going on strike on June 30, when their present scale expires. These, though, were voted down and the offer of the founders was accepted. The molders wished to have the minimum pay raised from $3 to $3.25 a day, which the founders absolutely refused to do. The minimum rate thus remains at $3 a day, with an increase of 6¼ per cent, which means a rate of $3.20 a day on the average for a day of nine hours. The men all agreed to the compromise and all talk about a strike in organized plants is thus at an end. There are, however, some 30 independent plants in the district with which no terms have yet been made. The agreement of Friday night will be submitted to them within the next few days with the request that an answer be returned by June 28. In other words, if the independent plants will not consent to sign the compromise scale of Friday night the molders there will go on strike.

One Concern's Sales.

The Allis Chalmers Company advise us of the following partial list of engine sales for May: Wolf River Paper Company, Shawano, Wis., one 18x40 inch, one 22x48 inch 1890 frame Reynolds-Corliss engines; Southern Cotton Oil Company, New York city, one 14x36-inch, four 18x42 inch girder frame Reynolds-Corliss engines; Surry Lumber Company, Baltimore, Md., 26x48 inch 1890 frame Reynolds-Corliss engine; S. P. Brown & Company, Albany, Ga., 16x42-inch girder frame Reynolds-Corliss engine; Devoe & Reynolds Company, Chicago, 22x42 inch 1890 frame Reynolds-Corliss engine; Carnegie Steel Company, Pittsburg, Pa., five pair vertical cross compound blowing engines, steam cylinders 46-inch and 86x60-inch, air cylinders, 84-inch and 84x60-inch; Jones & Laughlins Company, limited, Pittsburg, Pa., 79-inch air cylinder; Rapid Transit Subway Construction Company, New York city, two combined vertical and horizontal Reynolds-Corliss engines, cylinders, 42-inch and [illegible]-inch; Union Steel Company, Pittsburg, Pa., three [illegible] horizontal cross compound direct coupled Reynolds Corliss engines; Willis Coal & Mining Company, Murphysboro, Ill., [illegible]-inch Reynolds Corliss engine; Guenther Foundry Machine & Supply Company, San Antonio, Texas, [illegible]-inch girder frame Reynolds-Corliss engine; Buffalo Union Furnace Company, Buffalo, N. Y., vertical long crosshead blowing engine, steam cylinder [illegible]-inch, air cylinder [illegible]-inch; Studebaker Brothers Manufacturing Company, South Bend, Ind., [illegible]-inch 1890 frame horizontal cross compound direct coupled Reynolds Corliss engine; Colorado Mining & [illegible] Company, for Monte Vista Mill, Colo., [illegible]-inch girder frame engine; Great Western [illegible] Company, Cal., one 14x36-inch Reynolds girder frame Corliss engine; Park City Sampling Mills, Utah, one 18x36-inch Reynolds 1890 frame Corliss engine.

The Corporation Restrained.

Vice Chancellor Emory, at Newark, N. J., June 16 gave an opinion making a temporary injunction secured a week ago by Martin Berger of Sullivan county, New York, permanent. The injunction restrains the United States Steel Corporation from retiring $200,000,000, of preferred stock and issuing $250,000,000 in bonds instead.

R. V. Lindabury, counsel for the United States Steel Corporation, gave notice of appeal.

In his opinion the vice chancellor held that the retirement of preferred stock constituted a preferential reduction of the corporation's capital among those assenting to the plan and a corresponding impairment of the right of those not assenting.

According to the decision preferred stockholders have vested property rights which cannot be impaired by a board of directors without the consent of the holders of preferred shares.

A Few Recent Sales.

Recent sales of the engineering department of the Pittsburg Gage & Supply Company, this city, include two 350 horse power water tube boilers, with stokers and coal conveying apparatus for the Montrose pumping plant, Allegheny; eight stokers for the Allegheny city lighting plant; a 1,000 horse power Patterson-Berryman water heater for the Whipple Colliery Company, and a 125 horse power Patterson-Berryman water heater for the Lake Erie Limestone Company.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—A somewhat easier condition as to deliveries and less insistence among consumers for prompt shipments form the only change in the week's markets. The problem on the side of producers is to meet the necessities of buyers and among consumers how to best economize as to maintain desirable distribution of operations.

The feeling among consumers, however, is noticeably easier as it has become apparent that there never was serious danger of a famine and with the importation of the German and British material famine discussion is out of the question. Prices are struggling toward a higher level but on the whole there are no changes except those incidental to spot deliveries.

CURRENT QUOTATIONS:

Basic	$20 50	22 75	Splice bars	1 50	
Bessemer		22 75	Angles	1 60	
Charcoal, hot	$2 00		I beams	1 60	
Charcoal, cold	32 50		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 7[illegible]
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	36 00		No. 1 cast	17 00	17 [illegible]0
Open hearth	37 00		Iron rails	25 00	2[illegible] 00
Steel bars	1 80		Car wheels	18 00	19 00
Iron bars, refined		2 10	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	3 00	
Bolts, iron, sq nut	2 50		Sheets, 27	3 10	
Hex nuts	2 65		Sheets, 28	3 20	
Spikes	2 00				

Philadelphia —The volume of business in the local pig iron market is very small and confined to immediate deliveries. Prices are almost impossible to quote with exactness. From $21.50 to $22.50 is about the range for No. 2 foundry, with other grades in proportion. Some small lots are reported to have been sold for deliveries during the first and second quarter of 1903 at $20.50 to $21 for No. 2 foundry and $21 to $21.50 for the last three months of 1902. Foreign iron can be sold at about $1 less when it can be had promptly. Quotations for the standard brands of Northern iron are about as follows for deliveries during the last quarter of 1902 and the first quarter of 1903, earlier dates commanding anywhere from $1 to $1.50 more money; No. 1 foundry, $21.50 to $22.50; No. 2 foundry, $20.50 to $21.50: gray forge, $19 to $19.50.

Business in steel billets is confined mostly to purchases from abroad. German steel is selling at $30 to $30.50, ex-ship, and English at $31.50 to $32.50. American steel is hard to get at any price.

In the manufactured iron and steel trade conditions are about as they have been. Steady bookings of structural material continue to be made by the mills for next year's delivery. Mill deliveries of plates are further behind, and premiums are obtained on early deliveries. The bar trade is quiet and irregular. There is a moderately good demand for sheets, but a good many large buyers are covered and are out of the market.

CURRENT QUOTATIONS:

Foundry, 1	$21 50	22 50	Girder rails	32 00	32 [illegible]0
Foundry, 2	20 50	21 50	Angles, 3" & lr'gr		1 80
Gray Forge	19 00	19 50	Under 3-inch		1 90
Bessemer billets		34 00	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

New York—Rogers, Brown & Company—Following the movement in the steel trade, interest in pig iron begins to center in 1903 deliveries. The attitude of buyers has until now been indifferent touching next year's business. but some of the largest consumers begin to feel the need of securing raw materials to cover contracts, hence some considerable contracts are finding their way on to furnace books for January to June deliveries. It is significant that all such buying is volunteered. Pig iron makers are assured of higher costs all along the line. Where the increase in cost of labor and materials will end, can not be foreseen. For this reason it is thought best to go slow on future commitments.

One question of prime importance to the future of the market seems to be settled by the events of the past two weeks. This is whether consumption will be materially checked, when the old contracts are worked out and the final consumer has to pay current market rates. In pig iron it is estimated that the average current cost to foundries and mills is $3.00 per ton less than prices at which iron can now be bought for future deliveries.

CURRENT QUOTATIONS:

No. 1X fdy Nohn Jersey City	$20 65	21 00	Angles	2 00	2 50
No. 2X fdy Jersey City	21 50	22 50	Tees	2 00	2 50
No. 2 plain Jer. C	19 25		Zees	2 00	2 50
Sohn. 1 fdy N. Y.	22 00		Time deliveries, basis $1.75 for angles, beams and channels		
No. 2 fdy N. Y.	21 00		Com. base, bars per 100 lbs.	1 65	1 70
No. 3 fdy N. Y.	20 50		Refined base, bars	1 85	1 90
No. 1 soft	17 75		Bands, base	2 40	2 50
No. 2 soft	18 00		Norway bars	3 75	
St'l r'ls Estrn mill	28 00		Norway shapes	4 25	
Sheets, 3-16 and ¼ red, at store, N. Y. per 100 lbs.	2 30	2 40	Old T rails, iron f. o. b. cars	20 00	21 00
Sheets, blue annealed, 10	2 70	2 80	T rails steel f o b c	16 50	17 50
Mach. steel, base, at store, N. Y., per 100 lbs.	1 90	2 00	No. 1 wro't scrap iron f o b cars	17 50	18 00
Plates ¼ and heav	3 15		No. 1 mach. scrap	13 50	14 50
Ship & tank plate, on dock	2 50	2 80	Old wrought pipe and tubes	13 00	14 00
Sheets, galvan. ex store N. Y.	70 & 5 to	70 & 10	Old car wheels, f. o. b. cars	16 00	17 00
Beams and chan'ls 15-in & under	2 00	2 50	Old ham. car axl's f. o. b. cars	22 00	23 00
			Wrought turnings deliv. at mill	11 50	12 00

Chicago—Northern and Southern irons are selling higher for quick shipments. Sales of South-

ern have been made at $19, Birmingham, for No. 2 foundry, or $22.65, Chicago, and local iron, same grade, at $22.50. Inquiry for spot iron is limited. For deliveries during the first half of 1903 the inquiry is fair, and about $16.50, Birmingham for No. 2 or $20.15 Chicago, and $21 for local. No. 2, are about the minimum quotations.

For finished products the market is slowing down. Prices do not show any recession, unless in iron bars, which have been from $2 to $4 above the prices of steel bars. Some Western mills become hungry for orders and are inclined to slightly shade prices.

Buying of rails and structural for 1903 deliveries, continues on a modest scale and for early wants these products are steadily rising in value There is moderate buying of open hearth billets on a basis of about $38.

CURRENT QUOTATIONS:

Bessemer	22 00	23 00	Sheets, 26 store	3 25	3 40
Fdry Nohn 1	21 50	22 50	No. 27	3 35	3 50
Northern 2	21 00	22 00	No. 28	3 45	3 60
Northern 3	20 50	21 50	Angles	1 75	
Southern 1	20 65	22 15	Beams	1 75	
Southern 2	20 15	21 65	Tees	1 80	
Southern 3	19 65	21 15	Zees	1 75	
Forge	19 15	20 55	Channels	1 75	
Charcoal	22 50	23 50	Steel melt'g scrap	18 00	19 00
Billets, Bessemer	33 00	34 00	No. 1 r.r. wrought	21 00	22 00
Bars, iron	1 80	1 90	No. 1 cast, net ton	15 00	16 00
Bars, steel	1 75	1 90	Iron rails	24 00	25 00
Rails, standard	28 0	30 00	Car wheels	20 00	21 00
Rails, light	34 00	40 00	Cast borings	10 00	11 00
Plates, boiler	1 90	2 00	Turnings	13 50	14 00
Tank	1 75	1 80			

Cincinnati—Another advance in prices went into effect in this market Monday and will go higher before the pressure is lifted. Business in pig iron has been solely of a jobbing character, and in such small lots as consumers have been able to obtain for immediate pressing requirements. These consumers failed to estimate their wants, and now have to pay the penalty in the advance.

Domestic billets continue scarce, but foreign material is reported as coming in on old contracts.

There is little or no change in manufactured products. Plate mills are overcrowded. Structural is strong and urgent requirements are known to exist, but they are not being forced into the market because of the known inability of manufacturers to do better for customers. The demand for sheets has fallen a great deal as compared with the early part of the year.

CURRENT QUOTATIONS:

South. fdy. 1	20 75	$21 0	Standard Sections	29 90	30 90
South fdy. 2	20 25	20 50	Sheet, 26	3 40	
South. fdy. 3	19 75	20 00	Sheets, 27	3 50	
South. fdy. 4	19 25	19 50	Sheets, 28	3 60	
Grey forge	19 25	19 50	Angles, 3 to 6 in	1 70	
Mottled	19 25	19 50	Angles, 1¼ to 2½	1 82	
South 1, soft	20 75	21 00	Beams and Chanl	-	
South 2, soft	20 25	20 50	15 in and under	1 70	
L. Superior, fdy. 1	23 00	23 50	I b'ms 18, 20 24 in	1 80	
L. Superior, 2	22 00	22 50	Tees	1 75	
L. Sup'r char'l c w	23 00	24 00	Z's	1 70	
Hang'g r'k col, 1			1 wrought scrap	19 00	20 00
Sou u col c w			Steel mlting stock		
Jaks'n cy. sil'v'y 1	22 00	22 50	gross ton	16 00	

St'l bra base bil ex	1 72	No. 1 cast	18 00	
Iron bars	1 82	Old iron rails g t'n	22 00	
Flange plates	1 80	Old car wheels	20 00	
Tank steel	1 70	Cast borings	6 50	9 00
Ordinary fire-box.	1 90	Turnings	12 00	
Light rails	39 00			

Birmingham.—Furnacemen state that they are offered fancy prices for immediate delivery iron but nothing can be done. No. 1, foundry, has sold as high as $19 per ton, while No. 2, foundry, has sold at $17.50 and $18 per ton. Steady quotations have No. 2, at $16 per ton. The last three quarters of the year will see no little amount of iron go out at $17 per ton for No. 2. foundry.

There is inquiry for iron for delivery the first of next year but if any sales have been made no statements are given out. An effort has been made to create an impression that prices will not hold up during the coming year, a statement being given circulation that brokers do not believe the present prices can be maintained. However, the furnacemen are not anxious to sell at prices under the present figure.

CURRENT QUOTATIONS:

No. 1 fdy. Sohn	$17 50	18 00	Tank	1 80	
No. 2 fdy. Sohn	17 00	17 50	Steel smelt'g scrap	14 00	
No. 3 fdy. Sohn	16 00	16 50	No. 1 wrought	14 00	
Grey forge, Sohn	15 50	16 00	No. 1 cast	12 00	
Billets	28 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 0	3 50
Boiler plates	1 90		No. 28 sheets	310	3 60
Fire box	2 00				

Coke.

A summary of the Connellsville region for the week shows 20,618 ovens in blast and 668 idle.

The following figures show the scope of operations.

Production for the week	247,462 tons.
" last week	246,754 tons.
Increase	708 tons.
Shipments—	
To Pittsburg and river points	3,986 cars.
To points West of Pittsburg	5,225 cars.
To points East of Everson	3,010 cars.
Total	12,221 cars.
Last week	12,054 cars.
Shipments in tons for week	251,060 tons.
" " " last week	251,800 tons.
Decrease	740 tons.
Masontown Field	
Shipments for week	585 cars.
" last week	529 cars.
Increase	56 cars.
Shipments in tons	15,210 tons.
" last week	13,754 tons.
Increase	1,456 tons

Coke Prices.

Pittsburg—Furnace, $3.25@3.50. Foundry, $3.50@3.75.
St. Louis—Connellsville, $5.25@5.50. West Virginia, $4.25@4.50
Cincinnati—Connellsville, $5.00@5.25. Kanawha, $4.60 Stonega, $4.60

Coal.

Pittsburg—Better car supplies have had the effect of easing the temper of the coal shippers but the season's movement has not reached expectations and probably will not although the railroads are favoring the coal men at the expense of other shippers. The movement is retarded by the uncertainty of the car supply but in general shows some improvement.

Cleveland—The coal situation does not change much, other than that there was a little easier supply toward the end of the week, and the boats were loaded with more freedom. The coal docks are still jammed with boats and the shippers are in a contest as to who shall have the first chance at the loading machinery.

Chicago—There is less demand for steam coal. The large users have stocked up extensively and reduced orders. Receipts of Eastern coals do not improve, the difference being towards a diminution of deliveries. Consequently prices of Eastern coals are very strong, some grades advancing about 10 cents per ton. However the call for West Virginia coal is so much stronger in the East that the small advance in quotation here does not attract any free tonnage.

Cincinnati—There has been no movement to speak of, but prices have been maintained, and the market is firm. Pittsburg is held at seven cents per bushel of 2,688 cubic inches and Kanawha at six and one-half to seven cents afloat. Prices to consumers are: Pittsburg, $3.00; Kanawha, $2.75 to $3.00; smokeless, $3.00; anthracite $7.00.

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including June 16, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS	RUNS.
Transit	428,121	213,781
Tidewater	158,131	47,838
Southwest	23,735	117,168
Eureka	17,626	468,419
Buckeye, Macksburg oil	14,875	184,176
New York Transit	239,324	
Southern	337,928	....
Crescent	117,994	....
Total	1,337,380	1,085,228
Daily averages	89,159	72,349
Buckeye / Indiana Local Division	850,272	815,586
Daily average	56,685	54,372

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
June 11	$1.35	$1.20	$1.20	$0.88	$0.83	$0.83
June 12	1.35	1.20	1.20	0.88	0.83	0.83
June 13	1.35	1.20	1.20	0.88	0.83	0.88
June 14	1.35	1.20	1.20	0.88	0.83	0.80
June 16	1.35	1.20	1.20	0.88	0.83	0.83
June 17	1.35	1.20	1.20	0.88	0.83	0.83

Ore Situation at Cleveland.

The week was one filled with delays to the ore boats, and presented the anomalous condition of delays in one place and a great demand for vessels at the other end of the route. The serious feature is that by the delays which occurred during the week the June movement has been greatly reduced, and it will be next to impossible to make it up. The Soo blockade was so serious that the total movement for June has been so seriously affected that it will be much less than was expected. At the same time there was said to be such a demand for boats up above that some of the owners claim that in other days this would have meant an increase in the rates of carriage. The week closed, however, without any material change in the rate situation, as the sudden rush of boats to the head of the lakes has changed the aspect of the market, and has put the shippers in position to refuse a number of the boats offered.

The Metal Markets.

LONDON—Tin—£131 10s-£130. Sales 400 tons spot; 870 tons futures.

Copper—£54 5s-10s. Sales 700 tons spot; 525 tons futures.

Lead—£11 5s-6s 3d.

Spelter—£18 12s6d-17s 6d.

NEW YORK—Tin—$30.62½-$30.20.

Copper—Lake, 12⅞-12⅝; electrolytic, 12½-12¼; casting, 12⅛-12¼.

Lead—$4.15.

Spelter $5.00-$4.75.

ST. LOUIS—Lead—$3.97-$3.95.

Spelter—4.60-4.50.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c.
100 lb. " ....35c. "	ton lots and over......33c.

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb.
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ..... .35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. per lb.
100 lb. " ....30c. "	ton lots and over......27c.

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots; lots of 100 pounds, $1.10 per lb.; special price on large lots.

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 45
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4 10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs. Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4 9- Bessemer Steel, 100 lbs. $4 75

Memorial on the Proper Valuation of Pig Iron for Foundry Purposes.

By DR. RICHARD MOLDENKE.

The writer respectfully begs to memorialize the American Foundrymen's Association on behalf of a better method of valuing pig iron for foundry purposes than is at present in vogue.

As far back as our memories will carry us, there have been made pig irons of good, indifferent, and poor value, for the making of castings, and with few exceptions they have been sold on practically the same terms. In view of the fact that at the present time every effort is bent upon securing better material for our castings in order to hold the field cast iron is entitled to, it behooves us to devise some standard methods by which a poor iron may either be culled out, or else sold for its intrinsic value only. On the other hand, the maker of pig irons which have suffered least from careless burdening, improper mixing of ores with waste products, and other practices better known to the furnaceman, but not tending to good strength in the resulting pig, should be rewarded therefor accordingly.

Dr. Richard Moldenke, Re-elected Secretary of the American Foundrymen's Association.

It is a well known circumstance to all founders that pig irons of the same shape, grade, and presumably the same composition but coming from different furnaces, when remelted under as nearly the same conditions as possible, will often show entirely different strengths. Those who have laboratories will know that this is even the case when the composition is approximately identical. For this reason it is somewhat of guess work to predict the strength of a casting from the composition of the irons used, and an element of doubt remains even with the best of mixing and manipulation.

Now that the Standardizing Bureau of our association has made such a splendid record in the course of bettering methods of foundry procedure, why not let it go one step further, and instruct it to devise methods by which we can better judge the value of the pig irons offered us.

As a starting point the following is suggested: The value to us of a pig iron is seen only in its remelted state, therefore to test it we must put it through cupola or furnace, and under conditions which will give it the fairest chance possible. Furthermore the iron should be cast into test bars according to the standards provided for by this association. An analysis of the pig iron and the test bars as well as the physical tests of the latter, can then be made, and we will know that a given iron when remelted and tested has such and such a strength for such and such a composition. We may then choose for our work, condemning the weak irons and selecting those which show promise of fulfilling the conditions required.

Since the furnacemen should have the means of valuing the iron he sells just as much as the foundryman who does the buying, it would be advisable that specifications be drawn up for a standard test cupola, standard methods of melting, pouring, etc., of a stated amount of pig iron. A suitable blank should be drawn up in which can be filled all the information necessary to properly value the iron.

Furthermore, it is suggested, that besides

these standard methods to the trade for the individual use of anyone who desires to obtain the information, facilities be given the Standardizing Bureau to take this matter in hand themselves for the benefit of those who do not care to go to the trouble of carrying out the process on the exact lines indicated. The bureau will then be in position to actually make the bars for test and prepare the samples for analysis. The bars can then be sent for test and the samples for analytical work to the laboratory specified, or in the absence of instructions, be turned over to an approved laboratory. A moderate charge should be made to cover the work done, and to make the undertaking self-sustaining.

Should the plan here outlined prove feasible, the furnaceman who has good iron will find it a much easier matter to induce the prospective purchaser to try it. The foundryman, on the other hand, can buy the iron subject to the standard test, to secure the results he wants, which he can demand guarantee.

Gradually there will be a series of tests available which will serve to indicate the physical properties of good iron of a given composition when remelted, and we will hear less of inferior irons worrying the founder who has to furnish high grade castings. The writer would therefore offer the following:

Resolved, That the Committee on the Standardizing Bureau be requested to study the proper valuation of pig irons for foundry use, and if possible, report standard methods therefor at the next convention.

Shop Conditions.

By HUGH McPHEE, Bridgeport, Conn. [Presented at the Boston meeting of the American Foundrymen's Association.

TAKING the average foundry of the present day, generally speaking, we find conditions existing that are not creditable to either employer or the foreman in charge. A lack of interest, it seems to me, is the cause of this. The molder and apprentice, in my estimation, should not be held responsible for this, for we find that the improvements in all the other departments of great manufacturing concerns result in benefit to both employer and employe. Unfortunately these results are not met with in the foundry. Not that less work should be done, but ways and means should be provided to increase the efficiency of a shop. This, I think can only be done by a combined effort on the part of the employer and his foreman to make the conditions such that the employe can have a place to work in that will give him heart and interest to do better than he ever did before.

Take the molder who commences at 7 a. m. As he strips for work, he hangs his clothes on a spike driven into the wall as near his floor as may be convenient. Many times these clothes drop to the floor, and no one bothers with them. Now he finds his flasks shook out during the night, but must tear the castings out of the sand, wet this down, get his shovel and temper his sand pile so that he can commence to mold.

By the time he is ready to mold a day's work he is played out, but by dint of practice and the necessity of doing so, he labors on with only one outlook before his mind—quitting time.

Now we know that things are usually severe enough to bear even with the best of conditions for we all have had more or less of just this experience. Believing that a remedy is absolutely necessary, let us look at the conditions prevailing in the machine shop and pattern shop. A machinist has a specified machine to operate with helpers conveying the castings to be finished to him, keeping him supplied with material to perform his share of the production. Producing finished work gives him an interest in it which is of benefit to his employer.

The same holds true in the pattern shop. The pattern maker has a bench to work at. His lumber is brought to the shop, laid down convenient to the saw and planer. He can get his material without any special exertion; in fact everything is placed for him in such a way that he has only to perform the work that his trade demands.

Now, why cannot we have some such conditions existing in the foundry. This is in itself a less desirable place to work in on account of the dust and dirt. Have a place for each man to hang up his clothes in, so that he can wear good ones. Have his floor in the same condition as the machinist has his—ready to begin work on. Let helpers prepare his sand piles that he can commence molding and not act in the capacity of a laborer the first two hours of the day. Let his castings be shaken out for him, his flasks be fixed up. He can then put in eight hours molding instead of six, and get out superior work and much more of it.

May this effort to present the subject in a somewhat different light, result in awakening the interest of my foundry colleagues, and that some action be taken toward the improvement of the conditions surrounding the molder. Then the trade will receive greater recognition everywhere, and stand second to none.

Shop Tools and Rigs.

By IAMES A. MURPHY, Erie, Pa. [Presented at the Boston meeting of the American Foundrymen's Association.]

AMONG the greatest economizers in our modern shops are properly designed tools and rigs, and not enough attention is usually paid to this end of the business. I do not mean to speak of such special foundry machinery as is usually procured from foundry supply houses, but those indispensable tools of cur own "get up" for lifting and conveying our molds and material and the rigs we use for making our molds in sand and loam.

Aside from first class management, the design and equipment of a shop is the greatest factor in cheap production. No shop with pretensions to being modern, should be without one or more traveling cranes, but these should be supported by a system of auxillary lifts along the sides of the shop. That traveling cranes are in many places a detriment to cheap production instead of an aid is partly because of this omission, and partly because many places do not know how to work them to the best advantage. It is a patent fact to all close observers that in shops having the best equipment, molders are kept continually waiting for lifts. Many reasons and excuses can be given, but the principal one is that our own inventive abilities have not kept pace with

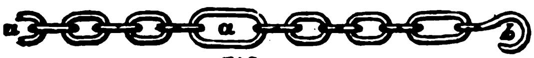


FIG. 1.

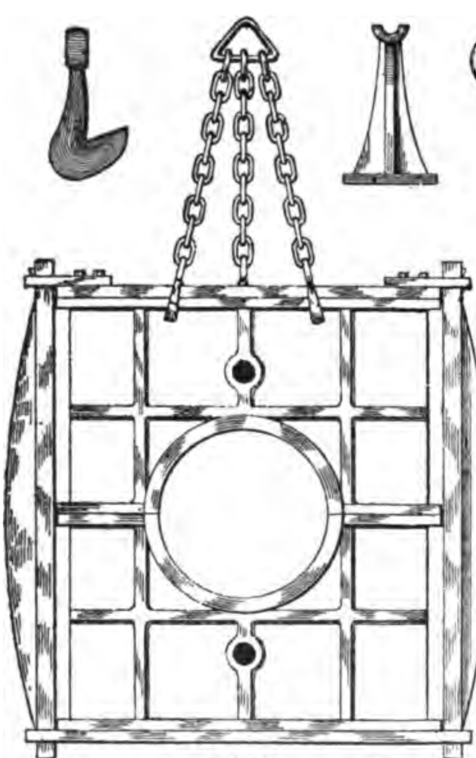
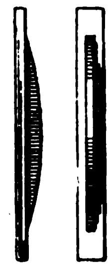
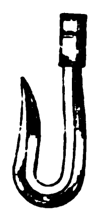


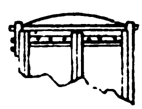
FIG. 2.

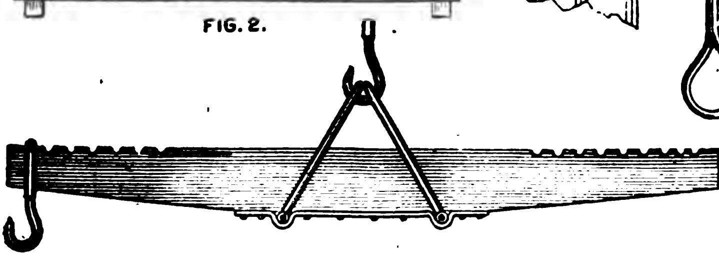
FIG. 3.



DETAILS OF BINDER







the times. Our flasks are designed without any thought of quick handling, and our lifting and hitching tools for the most part remain a relic of 30 years ago.

When a journeyman I worked in some large shops where only one set of lifting chains was provided, and when they broke, which was quite frequently, because of ill-usage, the greater part of the shop's crew was idle, waiting until they were repaired, which took some time as in one or two instances the blacksmith's shop was at a considerable distance.

That there should be two or more sets of chains of different sizes as well as plenty of hook, slings, etc., the best managers will admit. Fig. 1 is a style of lifting chain which I have in use, which adapts itself to four different lengths and gives admirable satisfaction. Two large links, (a) being placed at convenient points to allow for the doubling up and insertion of the hook (b). Fig. 2 is a sketch of the handiest lifting apparatus used in the foundry. Its easy adjustability and quick action are its best recommendtions. The sketch shows it hitched on a large cylinder ask, just the opposite from the way it is usually hitched on long flasks. When the flask is lifted off it is set so that the trunnions will rest in the horse at the right of the figure. The cope is then easily turned over by the men and the crane can pass along to further work. This operation when managed properly does not take more than a fraction of a minute.

The figure also shows a method of binding which so far as I am aware is a departure. It does away with the necessity of placing long bolts in bottom and top of flasks, and then screwing them up with binder in position. The cylinder flask shown has no bars, although the bore is 28 inches, but instead an iron grid on top to which are attached wrought iron eyes for the binder to go through. They are also cast in the grate on the bottom. All that it is necessary to do is to push the binder up a little and let it fall into its place in the bottom plate. A few wedges here and there and it is secure. By this means a man will securely bind a large mold in a few minutes. By some other methods in vogue this would take hours.

There is another point about the cant-hooks that should not be lost sight of and that is where copes that are partly rammed up or have cores hanging from them, so as to make a level lift with chains tedious, they are just the thing, as they will catch equally well anywhere on the flanges. For lifting any castings that have flanges or other projections out of the floor they have no superior. They are perfectly safe and when in use a short time they are considered indispensable.

The shifting or changing hook is a valuable tool, and mostly all shops have some kind of an arrangement. As it is usual, when carrying cores, ladles, and miscellaneous molds on the traveler, to first set them down before transferring to another crane, much time is saved by using a proper changing hook. With a hook such as is shown in the sketch, Fig. 3, it would be a quick and easy operation to lower off a load from the traveler to one of the side jib cranes. The hook has the advantage of a small first cost. No welds, easily managed, and thoroughly safe and serviceable.

The method of making flasks and the style of construction is a matter of great importance to most shops. I generally have a frame or outline of the part I want made by the carpenter, and the rest swept in the floor and cast open sand.

I append a sketch of a rather crooked "jig" for making the housing of a large vertical engine which was made in this way. Its general dimensions are about 13 feet long, four feet wide and four feet deep. Aside from the cost of the metal bolts and pins it cost me for pattern making $2.50, molding $14.07; and common labor $3.00, or a total cost of $19.57, which certainly is cheap for a flask of its size. The bottom plate was made in two parts so as to come in handy afterwards for core plates as shown in Fig. 4. The sketch itself is shown in Fig. 7.

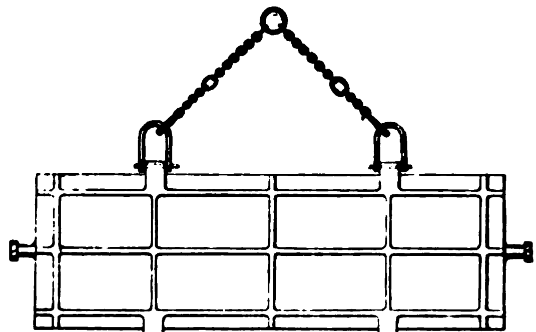


FIG. 4

Speaking of core plates, how many of us are there who have not seen the slipshod manner in which they are constructed in all shops, and how core makers have to put chains around core box and plate to enable them to "roll over." Such a method is not allowable in the best practice expect in extreme cases. A plate, the back view of which is shown, accomplishes the purpose of saving the core box, and the rolling over is easier, far quicker, and asfer. The box will not slip from the plate if securely clamped as it should be in any case. In some cases I cast in steel trunnions on the ends and find they often come in very handy. In others I core out hole and thread it, so that a trunnion with a standard thread can be screwed in in case of necesssity. Many cores are got out of shape by

rolling over in the old way, besides marring the boxes. Plates should be well ribbed and strong enough to prevent springing. The plate shown is a time saver and has many advantages over those in almost universal use.

The most clumsy tool among foundry lifting devices is the more or less modern I beam, and the cast iron and oak beams will remain with us for many years to come. For very large work I prefer a well designed cast iron or cast steel beam, while for medium work I have a decided liking for the oak on account of its lightness and general handiness. An oak beam like the sketch I made sometime ago, is a perfectly satis factory tool in every respect.

It will be seen that the beam is not weakened at any point by holes for the clevices, they being bolted to a wrought iron strap running under the beam and forming a perfect rest for it. It is secured to the beam with lag screws. A beam, hook and sling are shown in the illustration.

There are really few flask pins that give satisfaction. The device shown in Fig. 6 I have had in

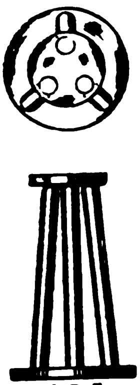


FIG. 5.

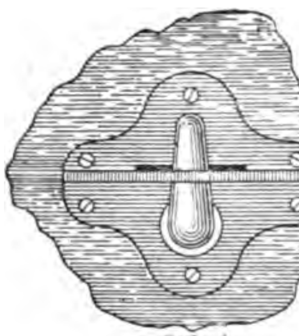


FIG. 6.

use nearly two years on a set of bench flasks, and so far is perfectly serviceable in every respect. It combines the handle pin and clamp, or fastening device, by simply pushing in a cut spike when the flask is closed, there being a shoulder on the pin for this purpose. The device is cast iron. I also employ the same style with slight alterations on all my wooden boxes with very gratifying results. The flask has not to be cut to put them on and they are simply screwed to the side. They are very quickly put on and the molder never has to take his lifter to pick the dirt out of the holes.

There could be many other things said on this inexhaustable subject which the limits of a brief paper of this kind necessarily curtails.

"Repeat moding" in loam sand and special rigs for rapid molding, I may in the near future make the subjects of another paper as these matters are very interesting to foundry managers, as it is in these particulars that the ingenuity and real ability of the foundryman is shown. The best pusher is he who gets up good "rigs," not for one prticular job, but for everything. Never think you have completed making improvements, there is always room. On many classes of work the foreman must be an engineer of no mean ability, and if he does not know his business, it will tell in construction work quicker than any other branch of the foundry management, excepting possibly, the mixing and melting of iron.

It is a common thing, in many shops, when a large cope is to be kept above the floor, to pile up the whole place with small wooden boxes, barrels and other truck to support it. A very light and handy set of horses for such purposes should be a part of every shop's equipment. I cannot imagine anything cheaper than the design shown in the sketch, as only some old pipe is needed and have a cast iron flange run around them on both ends. A sketch is shown Fig. 5. The clutch hook is also handy on the end of a strong chain for lifting awkward castings. The greatest care should be taken of chains and hooks, and they should be kept safe by occasional annealing. The loss of life which in many cases is akin to murder, is due in a great measure to this carelessness. Well designed lifting apparatus is a money maker, and the greatest of diligence should be exerted in keeping it in good and proper order.

FIG. 7

Reduce the Apprenticeship Period.

By [illegible], Moline, Ill. Presented at the Boston meeting of the American Foundrymen's Association.

IN England, the apprenticeship term used to be seven years. What it is there today I do not know; but in America, four years constitute the generally prevailing term.

The conditions existing at the time that seven years was established as the standard, justified, no doubt, that long period of service. Nor can it be doubted that progress in the industrial arts, together with advance in the general intelligence warranted the great reduction of the apprenticeship term when four years was adopted as sufficient.

It seems to me that the time is at hand for a still further curtailment. We have made greater advance since the establishment of the four year term than during the previous history of the world. Any argument that was valid for the drop from seven years to four, applies now with manifold force for another large reduction.

Never before has the demand for skilled labor so greatly outrun that for common, or unskilled labor.

Sustained industrial prosperity depends as much upon supplying the demand for goods as upon the demand itself. If the industrial world takes opportunity by the forelock, and so fulfills the prevalent conditions that make for permanence of the marvelous system that is rapidly enriching the people of America, there will be no chance for reactionary elements to gain an effective momentum.

The demand for product exists; all effort should be bent in the direction of supplying the demand.

The factors of the industrial system are inevitably reciprocal. Effective demand cannot exist without its correlative supply, and vice versa.

Now, the upward march of industry has, in large measure, lifted the world's work from the sphere of common labor to that of skilled mechanics. And the transition in this direction is now more rapid than ever before; and but for the impediments that ignorance throws in the way of progress, there would soon be an end of all unskilled labor.

Why should any man harvest his wheat with a hand sickle, or plow his ground with a crooked stick? Why should any of the operations of the manufactory be abandoned to so low a plane as to dispense with the element of skill? Nay, rather, why should not every operation of the great industrial machine be so advanced as to require emulation and quick intelligence on the part of every human participant?

Cut the apprenticeship period in two at the middle. Two years' application will do more toward perfecting a mechanic along modern lines than four years under the ancient regime, when mechanics were of the all-round character, instead of being limited specialists, as at present and as the future will more and more insist upon.

The employe loses far more by loss of business incident to the protracted apprenticeship term than he can possibly gain from the comparatively large profit on the last two years of the apprentice's service. And the whole of society loses the possible increased wealth that would result from duplicating the army of skilled artisans every two years instead of every four. Throw in the balance the intellectual and moral gain of society that would spring from so great an uplift of the submerged, lower stratum of men, and, it seems to me, we have an accumulation of incentives to the proposition that heads this paper that should brush aside every thought of opposition.

Synopsis of Paper on Appplication of Metallography to Foundry Work.

By ALBERT SAUVEUR. [Presented at the Boston meeting of the American Foundrymen's Association

REMARKS concerning the close analogy between the structure of cast iron and the structure of steel.

The appearance of wrought iron under the microscope.

Change of structure due to the introduction of a small amount of carbon converting thereby the iron into soft steel.

changes produced by an increase in the amount of carbon.

The structure of medium-hard and of hard steel.

White cast iron considered as a very high carbon steel.

The structure of white cast iron.

Absolutely gray cast iron is made up of a matrix of iron and particles of graphite.

The structure of gray cast iron.

Cast iron containing both graphite and carbon is made up of a steel matrix and

articles of graphite.

The structure of gray cast iron containing in-easing amounts of combined carbon.

Relation between the strength of cast iron nd its structure.

Value of the microscope in revealing the pres-ıce or absence of the structure corresponding ı greatest strength.

The influence of the rate of cooling, of silicon, ıd of other impurities upon the structure.

The detection of phosphorous under the mic-ıscope and its effect upon the structure.

Effect of chill upon the structure.

Standard Specifications for Steel Castings—As lopted by the American Association for testing ıaterials, of which the American Founrdymen's ssociation is a member. These specifications :e presented before the convention with a view ' eliciting further discussion on the subject.

Steel for castings may be made by the open-earth, crucible, or Bessemer process. Castings ı be annealed or unannealed as specified.

Ordinary castings, those in which no physical :quirements are specified, shall not contain ver 0.40 per cent of carbon, nor over 0.08 per :nt of phosphorus.

Castings which are subjected to physical test ıall not contain over 0.05 per cent of phosphor-s, no over 0.05 per cent suplhur.

Tested castings shall be of three classes: Hard;" "Medium," and "Soft." The minimum ıysical qualities required in each class shall be s follows:

	Hard castings	Medium castings	Soft castings
ensile strength, lbs. per sq. in.	85,000	70,000	60,000
ield point, lbs. per sq. in.	38,250	31,500	27,000
longation, per cent in two ins.	15	18	22
ontraction of area, per cent	20	25	30

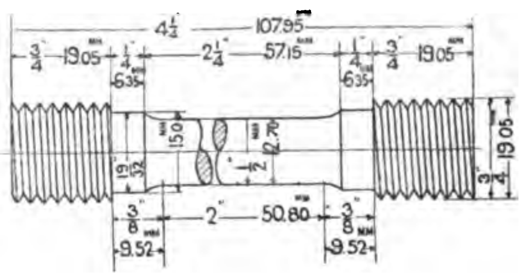
A test to destruction may be substituted for ıe tensile test, in the case of small or unim-ırtant castings. by selecting three castings 'om a lot. This test shall show the material to : ductile and free from injurious defects and ıitable for the purposes intended. A lot shall ınsist of all castings from the same melt or blow, ınealed in the same furnace charge.

Large castings are to be suspended and ham-ered all over. No cracks, flaws, defects, nor eakness shall appear after such treatment.

A specimen one inch by one-half inch shall :nd cold around diameter of one inch without acture on outside of bent portion through an angle of 120 degrees for "soft" castings and 90 degrees for "medium" castings.

The standard turned test specimen one-half inch diameter and two inch gauged length, shall be used to determine the physical properties specified in paragraph No. 4. It is shown in the following sketch.

The number of standard test specimens shall depend upon the character and importance of the castings. A test piece shall be cut cold from a coupon to be molded and cast on some portion of one or more castings from each melt or blow or from the sink-heads, in case heads of sufficient size are used. The coupon or sink-head must receive the same treatment as the casting or castings, before the specimen is cut out, and before the coupon or sink-head is removed from the casting.



One specimen for bending test one inch by one-half inch shall be cut cold from the coupon or sink-head of the casting or castings as specified in paragraph No. 9. The bending test may be made by pressure, or by blows.

The yield point specified in paragraph No. 4 shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

Turnings from the tensile specimen, drillings from the bending specimen, or drillings from the small test ingot, if preferred by the inspect-or, shall be used to determine whether or not the steel is within the limits in phosphorus and sulphur specified in paragraphs Nos. 2 and 3.

Castings shall be true to pattern, free from blemishes, flaws or shrinkage cracks. Bearing surfaces shall be solid, and no porosity shall be allowed in positions where the resistance and value of the casting for the purpose intended will be seriously affected thereby.

The inspector representing the purchaser shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspec-tions shall be made at the place of manufacture, prior to shipment.

Report of Dr. Richard Moldenke, Secretary—Another prosperous year has been given us, where n to consolidated our resources, improve our plants, and plan new developments in our ever increasing industry. The difficulties encountered lay in getting material rather than orders, all foundries abreast of the times making money. As the foundry industry consumed over three and one half-millions of tons of pig iron, besides the proportionate amount of scrap, in the last fiscal year, and iron has averaged at least $15 a ton during that time, there is little wonder that with such enormous sums involved, and these distributed into every nook and corner of this great land, the foundry industry is looked upon as a good barometer of the general business condition of the nation. With indications pointing to a still further advance in pig iron through increased consumption, any of our founrydmen are contracting for next year's delivery, and fortunate are those who have covered this year's requirements at fair prices.

Our association seems to have experienced a similar change to a more prosperous condition the latter half of the fiscal year just closed, indicating an interest so marked that our members have every reason to be proud of the standing being acquired by it in one of the numerous lines of the industrial development of the world. There is an unusual amount of interest manifested in the study of cast iron. Those industries into which large quantities of castings enter, are making close enquiries about their quality. The molder's art is beginning to be recognized as one which is most intricate and important, and there is a general inclination to place the molder himself upon the plane of a highly skilled workman who should not waste his time and his employer's money by performing unskilled labor.

Perhaps the close economies effected in the steel industry by utilizing the highest skill obtainable, or, in other words, by paying for brains well directed, has left an impress on our own methods, for we also are beginning to demand the greatest production at the lowest cost, and are furnishing the best of facilities and paying the best of wages to do it.

There have been many changes in the membership of our association. Death has reaped a harvest, and removed many men most useful to our industry. The sad and tragic death of our worthy president, John J. Sadlier, was, perhaps, that least expected by us all. Halo and hearty while at our last convention, full of the fire of life while discussing the molder of the future upon the floor of the house; honored by founder and molder alike, he fell by the bullet of one of the very artisans he had helped to make. Appropriate action was taken at the time by our Executive Board: engrossed resolutions expressing the profound sorrow of our members for the man they had honored with the presidency, were conveyed to his bereaved family. The general wave of sympathy, finding its expression even in Europe, showed that the efforts to better the standing of the foundry as well as uplift the men employed in it were thoroughly appreciated.

In spite of the deaths, resignations, removals from the list, and consolidations, we can record a net increase of 18 names, making the total membership 314. The tide turned during the last few months of the year just closed, and was aided by the additon of members from England, Scotland, Wales, Germany and Holland. Inquiries from Denmark, Russia, South Africa and even India may result in extending the usefulness of our association to those fields, and go to show that the world is taking note of American foundry practice, and is presumably wondering how we can afford to be so liberal with our information.

During his recent travels in Europe, your secretary met with many of the foremost directors of industries, state officials, financiers and scientists and nearly everyone exhibited the liveliest interest in American methods of procedure, in our national resources and transportation facilities, and in our declared national policy. There were a few who affected to look down upon us with the scorn bred of centuries of industrial security, but who will none the less live to rave at the "American Peril" when we cut into their holdings. Everywhere cast iron was the topic of general interest. Your secretary, whom you so kindly accredited to represent our association abroad, found it well known everywhere through its work, even if it did have to translate its name into seven languages to enable the enquirers to watch specially for the proceedings in the technical press of their respective countries.

At the Buda-Pest congress of the International Association for sesting Materials, the study of cast iron was ably urged by the only three American members present, and each of the three is directly interested in a foundry. The result was the making of tests on cast iron a special feature of the work mapped out, and much will doubtless be learned by the associated effort of the many nations interested. Our own American Association for Testing Materials of which we are members, in its convention last week, devoted one entire session to reports on, and the discussion of, cast iron. The committee appointed by them to codify the matter of specifications will doubtless utilize those adopted by us last year to the best possible advantage.

On looking over the work of the association

for the past year, you will have noticed that it was very much in line with progress. The fact that we are nearly all foundrymen, and therefore with interests to conserve, has not prevented us from urging better methods to obtain better results. We are more interested in furnishing our customers with the best of castings than they may be willing to give us credit for, as we have to hold a field which the requirements of the times is making more and more difficult to care for. Our national economy will not long tolerate the production of great weights of inferior cast iron when comparatively light steel castings will do at least as well. The watchword is now to put the best of material into the best made castings, in great quantities and at extremely low costs. There is little wonder that the excellent papers on the molding machine now being published in our journal are attracting wide attention. We hope they may be extended a long time, and be made most exhaustive, so that a foundation may be laid upon which even future generations may build. We have also to thank the technical press, as well as the great engineering associations for the interest taken in our efforts for foundry betterment, in which they have given us substantial aid.

Your secretary begs to report further that the change of time provided for the payment of the annual dues has been effected. While this has cut off one-third of the income of the Association for the year, it has placed our finances on a sound footing, no advance dues being now taken to pay bills in arrears. The association will therefore hereafter pay as it goes, and can regulate its expenses properly. The fact that there were no outlays whatever incurred by the association during the absence of the secretary in Europe, hepled to tide over matters, and it is hoped did no injury to our members. The financial statement will be found in the report of the treasurer. Briefly summarized, the figures are as follows: Total income for the year, $2,353.98; total expense $2,352.62; leaving a balance of $1.36 in the treasury; no bills outstanding; the association free from debt and with as bright a future ahead as the members wish to make it by the extent of their substantial support. This excellent showing, is however, in a great measure due to the work of the Standardizing Bureau, the profits of which went into the treasurer. Our special thanks are due Mr. West for the disinterested manner in which he has devoted time and money in the furtherance of a work now everywhere recognized as of great value to the foundry and the steel industries.

From the item of $250 for postage, it will be noted that the office work of the secretary has been nearly doubled, but the good results have well repaid the additional effort this caused. There has been a great call for back numbers of the "Journal" especially by the libraries of our universities, the government, the public libraries and foreign sources. The supply is getting limited and some of the pamphlets which were printed in two editions are already exhausted.

Our "Journal" has been enlarged and only a press of other duties prevented it from taking an even more extended shape.

Our institutions of learning have not been idle in the matter of devoting time to the study of foundry problems. Besides a large correspondence with the professors most interested, your secretary as well as our Mr. West have recently addressed the students of several of our largest universities on foundry matters.

There are two further subjects to which our association might do well to give a substantial encouragement. The study of the electrical properties of cast iron in conjunction with Purdue University as reported to you last year but not acted upon further on account of lackof funds.

Then American support is most urgently needed by the Sidero Chemical laboratory established in Switzerland for international research in the very line which will be of the utmost value for the standardization of methods of the laboratory. Should we get into the position that something can be done for these matters substantial impetus for foundry progress will result in at least those immediate lines.

The work of the various committees has been assisted so far as possible by your secretary who in conclusion, wishes to thank the many members of the association for the kind expressions of appreciaton extended, the earnest help given, and the faith in the aims and ideals of our cooperative effort held forth, all of which has made him feel that the good will of the whole iron industry is with us in our chosen work.

Report on the Operations of the American Foundrymen's Association Standardizing Bureau—Thomas D. West, Chairman, Sharpsville, Pa., Richard Moldenke, New York. James Scott. Pittsburg, Pa., P. W. Gates, Chicago, Ill., E. H. Putnam, Moline, Ill.

Your committee begs to report that the sales of the Association's Standardized Drillings continue as large as during the last three years, and that this work is becoming of constantly greater importance as shown by a very much wider distribution.

Not only are the blast furnaces and laboratories dealing with cast iron utilizing our drillings for their daily standards, but where disputes arise concerning the accuracy of individual work, our standards are sent for to settle them.

Thus the purpose for which the bureau was originally created has been fully accomplished, and the iron industry has acquired a very material help toward a better basis for the daily routine.

During the past year a second lot of sample "D" has been made. We can also state that the bureau is now in position to furnish the trade single bottles of samples, "A, B, C and D," to cover those cases where the sets of three or four bottles, which sell for $5.00 and $6.66 respectively, are not desired.

The drillings can be obtained by addressing the chairman.

Through the efforts of one member of our committee a substantial reduction in the cost of analytical work has been secured for the trade, and this from two reliable laboratories in Pittsburg and Cleveland. Silicon, sulphur, phosphorus and manganese determinations at 40 cents each; and the carbons in iron and sulphur, carbon, and ash in coke at 70 cents, are the quotations made, with rebates on sliding scale where two or more determinations per day come from the same firm. The addresses and other information can be obtained from the chairman. The accounts of the bureau up to date of June 1, are as follows: Collections for the fiscal year, $352.87; expenses $97.83. Balance turned over to A. F. A. Treasurer, $255.04, or $642.34 in all, since the establishment of the bureau.

Progress Report on Standard Methods of Determining the Constituents of Cast Iron—Thomas D. West, Chairman, Richard Moldenke, James Scott, B. W. Gates, E. H. Putnam.

The importance of adopting standard methods for determining the constituents of cast iron was fully recognized by this association, when, at the last convention, it instructed the Standardizing Bureau to take up this work, and report thereon as soon as convenient. We beg to report that a large number of circular and personal letters have been sent out to the professional men in our industry, requesting memoranda upon their methods, with a view of selecting standards therefrom.

These reports will be duly published in the "Journal," (omitting all names) in order that all the information may be properly grouped for critical study by the experts who will be asked to select the methods best adapted to our requirements.

In the meantime your committee solicits further communications from active iron chemists in order to have as wide an experience to draw from as possible. The amount of material received already indicates a wide-spread interest in this work, and it is to be hoped that a final report can soon be made.

Report on Standard Methods of Sampling Pig Iron—Thomas D. West, Chairman, Richard Moldenke, James Scott, P. W. Gates, E. H. Putnam.

In conformance with the instructions received at the last convention, your committee begs to make its report on a standard method of sampling pig iron for foundry purposes.

In his memorial to the association urging standard methods of sampling, A. L. Colby emphasized the necessity of this action in order to void unnecessary complications between furnacemen and founder. Your committee, after studying the matter, has come to the conclusion that inasmuch as the furnacemen has the burden of the trouble to bear in case of rejections, it is in his interest to see that the various car loads of iron he sells are sampled by the purchaser in the fairest manner possible.

Your committee did not think it wise to specify the manner in which a furnaceman should sample his casts, interesting as it may be; for we are solely concerned with the particular car load which comes to us and have no means of knowing how many furnace casts may be mixed in accidentally or otherwise.

We further recommend that the method to follow be adopted provisionally only, in order to give the furnaces an opportunity to give us the benefit of their experiences during the coming year. Your committee can then report finally.

Specifications for Sampling Pig Iron—Eight pigs shall be selected from each car load of iron, two each from the upper and the lower portion of each half of the car. The eight pigs, being the average size and weight of the shipment, will be fairly representative of the whole.

These pigs are broken in such a way that a piece of convenient length showing clean fracture is available. The eight pieces are placed in a suitable box, and this duly marked with the car initial and number.

The freshly fractured and clean face of each piece is now drilled in two places halfway between the center and edge, a drill of large diameter being used. From the heap of drillings surrounding the drill enough is taken for the purpose wanted, placed on a sheet of glazed paper, and the drillings thoroughly mixed and preserved. In case of dirty or excessively sandy iron the magnet should be used on the sample before analysis, for additional safety.

Sufficient drillings shall be made to afford material for exchange with the furnace laboratory, as well as with a possible subsequent checking with the American Foundrymen's Association Standards.

The allowable variation from specified com-

positions shall be as follows: For silicon, 10 points either way (plus or minus 0.10 per cent.) For sulphur not over 0.005 per cent above the determinations: in case of a dispute, to be made by the oxidation method. For manganese, 10 points either way. For phosphorus, not over .05 per cent above for all irons running over 30 per cent. Below this the variation shall be a matter of special agreement. For total carbon, if specified at all, the variation shall be a matter of special agreement.

The variation of the check determinations between foundry and furnace, as well as with the American Foundrymen's Association Standards, shall not be over the following: Silicon .05 per cent; manganese, 0.5 per cent; sulphur, .005 per cent; phosphorus, .02 per cent, and total carbon, .05 per cent.

Report on the Grading of Pig Iron by Analysis—Thomas D. West, Chairman. Richard Moldenke.

Your committee begs to report that in view of the developments brought out during the discussion of this matter at the last convention, a very evident leaning being manifested toward the purchase of pig iron, simple by its analysis, irrespective of the question of grading by fracture, particular pains have been taken to inquire as to the extent to which this is actually the case in present foundry practice.

It was found that with the exception of the jobbing founder practically everyone else is now specifying the composition of the iron he buys, or else is particular to find out what he does get. For these founders, who consume about three-fourths of the pig iron sold to foundries, the labors of your committee would be superfluous. For the jobbers, however, who are in the great majority, so far as isolated small shops are concerned, much good could be done, and doubtless has been by the agitation the subject has received. Unfortunately we must report that there is no interest to be observed from that direction, very few of the several thousand jobbing foundries being members of our association, or interesting themselves in the elevation of their trade. These foundries will continue to buy their No. 1 and 2 irons by fracture, irrespective of what they really get, will have their little troubles and get over them as heretofore, and receive the leavings of the founder who buys by chemical specification, and sees that he gets what he wants. Your committee does not see that it can be of any use here either, for the present, beyond agitating for closer lines on the composition of the different numbers now in the market, a work which it believes is quietly going on.

Since the feeling in our association seems to be in the direction of exact methods of b iron, the majority of founders, not members of our association, do not appear to be interested, we would suggest that our committee be discharged.

The Foundry Trade School—Thomas D. West, Chairman: E. H. Putnam. Richard Moldenke.

At the last convention the Mr. West was appointed chairman of a committee to work in the interest of a Foundry Trade School, wherein apprentices could be given the best practical and technical training for their trade, this training to fit them for the responsibilities even of master-mechanics and managers. The committee was recently enlarged by the appointment of Messrs. Putnam and Moldenke, but owing to the short time available since then, no opportunity has existed for any concerted action.

In the meantime, however, articles have appeared on the subject in the trade papers, and much criticism has been provoked partly favorable to the proposition and partly unfavorable. Your committee believes that enough has been written during the year to warrant an expression of opinion on the part of the members of our association, as to whether the committee should be continued in the interest of this work.

It is the opinion of your committee that such an institution is badly needed, and that the day is not far distant when its importance will be disagreeably forced upon the trade. It will not do to sit by idly and be compelled to meet the issue. Far better to act at once. This is a movement, to be most successful, which should have the support of our foundrymen as well as the technical bodies interested in getting good castings.

Your committee asks for a full discussion of the matter in order to decide whether the work shall be conducted under the influence of our association, or be left to outside effort.

Treasurer's Report—Thomas D. West, treasurer.

Balance, $68.31; cash remittances from Secretary $2,285.67; Total, $2,353.98.

Amounts expended—Sundries $40.13; salaries $900.00; printing, $105.85; journal, $958.30; postage, $250.50 standardizing bureau, $97.83. Total $2,352.61 Balance in bank, June 6, 1902. $1.37.

A company to manufacture tin plate has been organized by Messrs. James L. Elston, N. J. Cappock, J. M. Beavo and others of Jonesboro, Ind., with a capital stock of $200,000.

The Convention's Close.

The seventh annual convention of the American Foundrymen's Association held in Boston, came to a close Thursday evening last. It was a pronounced success in every way, the New England Foundrymen's Association having done everything possible to make the convention the best ever held. All the business meetings were well attended. In all there were 225 members present in addition to about 75 ladies.

As stated in our last issue the convention began in Huntingdon Hall Tuesday morning, when official reports were made together with the presentation of various reports of committees, reading of papers, etc. In the afternoon the members visited many of the historical places in and around Boston, the day being celebrated as Bunker Hill day. Arrangements were made for entertaining the members at the Sremont Street theatre in the evening.

Wednesday morning another business session was held. Previous to the meeting the Boston school of Technology was visited by many. During the meeting papers were presented by those selected and discussions made. The meeting was highly interesting. Arrangements for a tally-ho ride through the parks and suburbs of Boston to the Watertown Arsenal, thence to the plant of the Walker & Pratt Manufacturing Company were carried out. In all there were 18 vehicles left the Brunswick Hotel for this trip, which proved to be one of the best on the programme. The Walker & Pratt Company had special guides for showing visitors through the works, which are up-to-date in every department. The plant is exceptionally well laid out and contains every reqiurement for the rapid handling of material and for the production of high class material. An elegant lunch was served on the lawns adjoining the plant. The Walker & Pratt Company was highly complimented for its thorough entertainment of the visitors.

On the following day a boat trip was taken to Nantasket Beach which was reached about 1 p. m. A specially prepared fish dinner was served, which every one present enjoyed. The return trip was made late in the day, arriving at the dock about six o'clock. In the evening a vaudeville and smoker was given for the benefit of the members of the association while the ladies were entertained in the parlors of the hotel by a male quartet.

The closing business session was held Thursday evening when six different papers were read and resolutions of thanks to the city government and to the New England Foundrymen's Association were adopted, in recognition of hospitality extended to the visitors during their three days' stay. Election of officers for the ensuing year was then taken up which resulted in the selection of A. W. Walker, of the Walker & Pratt Manufacturing Company, Boston as president; Dr. Richard Moldenke, New York, secretary, Willis Brown, of the Walker Foundry Company, Erie, Pa., treasurer. The vice-presidents elected were: J. F. Lannigan, Lawrence, Mass.; J. A. Beckett, Hoosic Falls, Mass.; F. H. Zimmers, Pittsburg, Penn.; A. I. Findley, Cleveland, O.; Christopher Wolff, Chicago; Adam Bair, Milwaukee, Wis.; J. P. Golden, Columbus, Ga., and T. J. Best, Montreal. It is practically settled that the next annual convention will be held in Milwaukee.

The Pittsburg delegation to the convention presented Secretary Zimmers of the Pittsburg association with a beautiful bronze piece in token of their appreciation for his faithful performances throughout the trip, Mr. Zimmers labored long and hard to secure proper transportation facilities and to attend to the many requirements of the party.

J. S. Seaman, recognized as the father of the Pittsburg foundrymen, was as active as ever at the convention. Mr. Seaman is an ardent supporter of the proposition to establish a foundry trade school in connection with the promised Carnegie Technical School and he hopes that his efforts will prove successful.

Dr. Richard Moldenke, now of New York, is still the same active hustling person as he was when located in Pittsburg. He stated that while living in New York his mind often drifted to Pittsburg and his many friends. His re-election to the secretaryship of the association was never questioned.

The newly elected treasurer Willis Brown, of Erie, Pa., writes us that if he had known that honors were to come to him in such a manner he would have had some photographs taken so that his picture could be presented to our readers.

Will L. Ducey, Boston, attended to the wants of many of the visitors. His attentions to the Pittsburg delegation were certainly appreciated.

L. S. Brown, Springfield, Mass., besides handing out a neat souvenir pocket book to the members, made himself well liked by paying attention to the entertaining of the ladies while the gentlemen were engaged elsewhere.

The S. Obermayer Company had S. F. Johnson, Chicago, and W. M. Fitzpatrick on the ground. The company distributed a neat aluminium fan as a souvenir.

Ex-president C. S. Bell, Hillsboro, O., still makes his annual trip to the convention. Mr. Bell is the oldest member in years attending the meetings and has never failed to be present.

J. S. McCormick, Pittsburg, disposed of a neat match box to each one present.

HIGHEST POWER STATION COAL-HOISTING TOWERS.

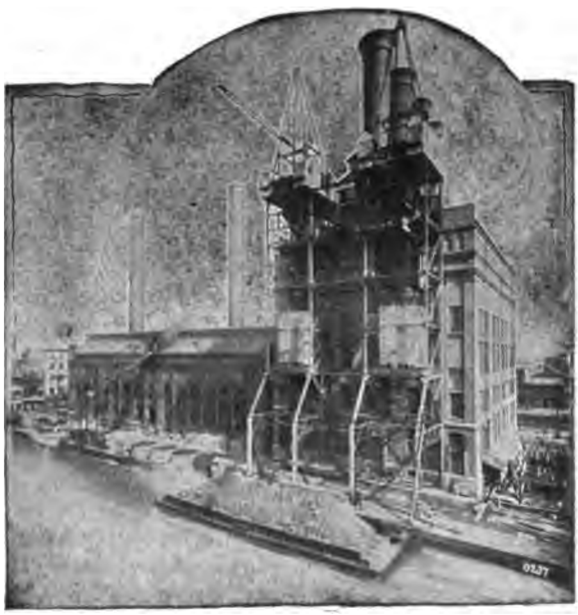
AFTER the various railway and electric companies of Baltimore were consolidated under one management, the United Railways & Electric Company owned 13 power houses. It was impossible to get economic results from these isolated plants, so that a central station was designed, from which current is to be distributed for street railway purposes throughout the great city of Baltimore. The site of the new station adjoins the old plant on Dugan's Wharf, erected by the City & Suburban Railway Company in 1895. A fireproof building 94x131 feet houses a boiler equipment, ultimately to be of 16,000 horse power capacity.

In the new boiler house now building, two 500 h. p. Babcock & Wilcox water tube boilers are to be located on two floors, and in four sections. Four stacks 200 feet in height and 13 feet inside diameter divide the entire building in two parts, with batteries on either side. Above the boilers are two coal storage bins with a capacity of 6,000 tons. Each bin is 12 feet wide, 24 feet deep and 128 feet long.

The arrangement of the plant necessitates raising the coal to a great height, which together with large fuel consumption made the conditions most exacting. The coal hoisting towers and machinery were designed and constructed by the C. W. Hunt Company, New York, while the arrangement of the electrical apparatus in the tower is due to P. O. Keihlholtz, Consulting Engineer of the United Railways & Electric Company.

On the East side of the boiler house two steel towers were built for hoisting coal, one of which has been equipped throughout, while work on a duplicate equipment is in progress. This plant has the double distinction of having the highest hoist of any power station, and being the only one of its kind equipped throughout with electrically operated hoisting and conveying machinery. Each of the coal hoisting towers is 183 feet high, and the horizontal booms, 52 feet in length, extend over the water. The one ton shovel is lowered by means of a cable passing over a truck which runs back and forth on the booms to the shovel below. The shovel hoist and boom truck are driven by electric motors geared to the hoisting drums.

When the shovel descends to the coal in the barge, the hoisting motor is started and closes the shovel, fills it with coal, hoists it loaded 151 feet over the tower and dumps the coal into a hopper at the front of the tower on the engine platform. The shovel is then lowered open to the coal, and is ready for another trip. An engineer and assistant regulate the operation of the hoisting machinery from the second platform in the tower, the former controlling the hoisting drum motor, and regulating the speed and direction of rotation; the latter controls the motor hoist actuating the trolley on the boom. The shovel does not twist in hoitsing or lowering, notwithstanding the great height of the hoist.



Pratt Street Station and Coal Hoisting Towers

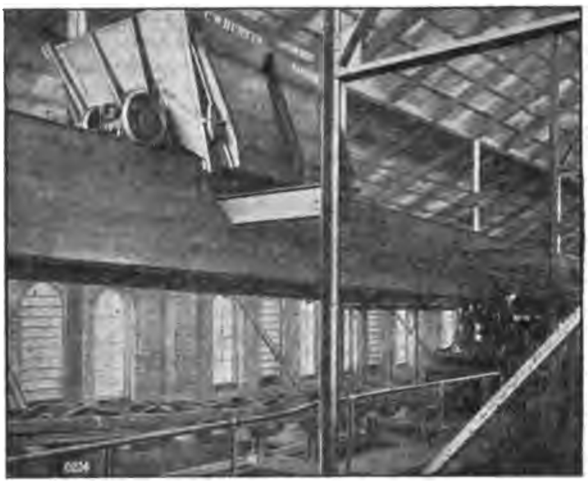
The coal passes from the hopper through a Hunt coal cracker, where the large lumps are broken to the proper size for automatic stokers. By means of a double jawed cut-off valve; the coal is fed into a Hunt automatic railway car, then weighed. After the car is pushed off the scales, it passes to an inclined track over the bins, and is automatically discharged by a stop previously located at the point where the coal is needed. The inertia of the loaded car on the incline is started in a counterweight which, when the load is dumped, returns the car to the scale for another load.

The tower was equipped by the C. W. Hunt Company, and has a capacity of 50 tons of coal per hour. Recent records show that the hoist

will deliver considerably more coal than the capacity mentioned. While the consumption of coal in a station of this size would probably be 100,000 tons per year, the coal handling plant has a capacity of 10 times that quantity of fuel taken from the boat and delivered to the storage bins.

Under each of the boilers is an ash hopper with cut-off valve; the Hunt noiseless gravity bucket conveyor receives the ashes which descend into, and are removed from the hoppers by gravity. The ashes are carried over the coal pockets and dumped into a chute leading into ash bins in the tower, from thence they are removed by car or boat. This conveyor is 430 feet long with a vertical lift of 86 feet and is motor driven. When carrying a load of ashes, it requires but five horse power to keep it moving, which is a demonstration of its mechanical efficiency.

No shoveling or manual labor of any kind is required in receiving, transporting or remitting coal or ashes from this plant, and the machinery is as nearly automatic in its operation as possible. The Pratt Street station is a good example of what can be accomplished with Hunt coal handling apparatus, and illustrates how the fuel and ashes of a metropolitan power house are handled with maximum convenience and economy.

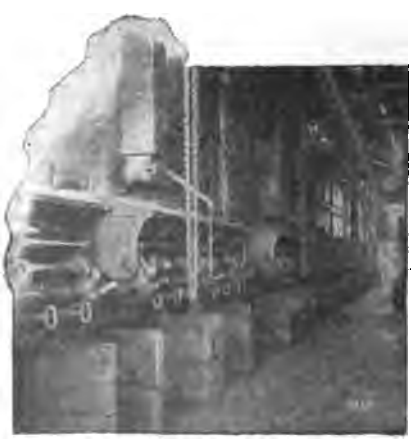


Hunt Conveyor and Motor.

Crocker-Wheeler Expansion.

The Crocker-Wheeler Company reports a satisfactory increase in orders during May over those for the preceding month. The company is making extensive preparations to accommodate the increasing business which during the past year has pushed the present shops to their utmost. A new building is under construction which will enlarge the present floor space by 60,000 square feet and will be occupied by the winding department, a part of the office force, and additional machine shop space. Some of the orders booked during May were:

Whitman Mills, New Bedford, Mass., one size 224-200 k. w. generator; Hanover National Bank, New York, three size 111's-100 k. w. each; American Colortype Company, Chicago, Ill., consignment of nine motors; Albert Saxe, New York city, two-50 k. w., and one 75 k. w. generators,; Descubridora Mining & Smelting Company, one size 168-150 k. w.; James McKane, Coney Island, N. Y.; one 60 k. w.; generator; Grasser & Brand Brewing Company, Toledo, O., one 75 k. w. generator and six motors; W. H. Wagner & Sons, Freeport, Ill., one 30 k. w. genertor and several motors: J. L. Mitchell, Philadelphia, Pa., one size 224-200 k. w., generator: Marshall Field & Company, Chicago, Ill., six motors aggregating 150 h. p.; Naomi Coal Company, Fayette City, Penna., one 110 k. w. generator; Ingersoll-Sargent Drill Company, one 80 k. w. generator; D'Olier Engineering Company, Philadelphia, Pa., one size 111-100 k. w. generator; Craig Shipbuilding Company, Toledo, O., two 150 k. w. generators; Maher & Flockhart, Newark, N. J., one 100 k. w. generator and one 45 h. p. motor; Vandergrift Construction Company, Mattewan, N. J., one size 224-200 k. w. generator; Niles-Bement-Pond Company, Philadelphia, Pa:, 50 crane motors outputs ranging from one and one half to 50 h. p.



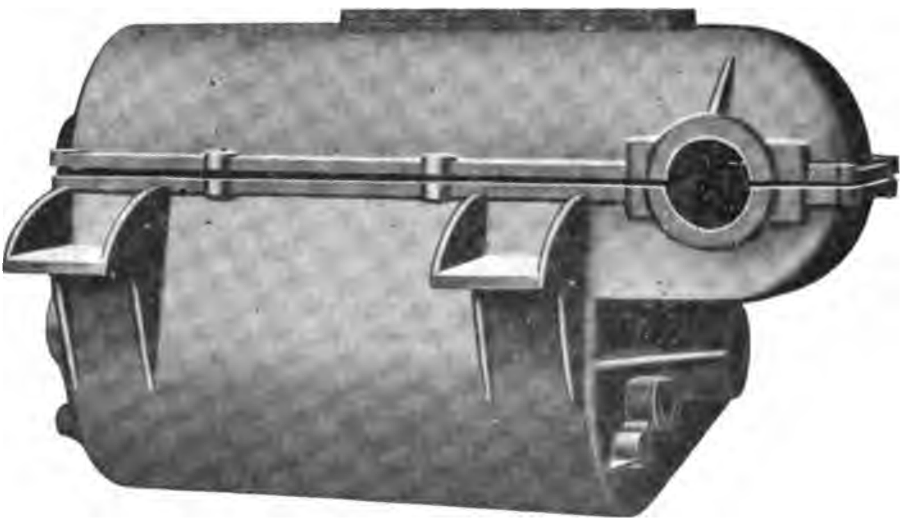
Boiler Fronts and Coal Chutes.

A Large Alluminum Casting.

The accompanying illustration shows a large aluminum casting which will be used as a crank case on a 45-horse-power automobile engine. The casting weighs 81 pounds and measures 32x22x15 inches. It was made by the United States Aluminum Castings Company of Cincinnati, O., of the company's new "Acme" aluminum metal and is one of several aluminum castings, weighing in all about 300 pounds, to be used in the automobile. The other parts consist of cylinder case, weighing 125 pounds, engine base etc. If cast in iron the combined weight of the different parts would be over 1,000 pounds.

The casting shown is beyond doubt one of the largest and most complicated, in aluminum, ever turned out with success in this country. The "Acme" aluminum used is composed of pure aluminum and an alloy, the merging of which is obtained through a private process employed by this company. With the process employed the tensile strength of the aluminum is increased from eight tons to 18 tons per square inch the color of the aluminum and polishing qualities are retained and the trouble heretofore experienced in casting, due to the tendency of aluminum to shrink and crack, is totally obviated. While great strength and machining qualities are added by the use of the alloy, the weight of the aluminum is increased but from two to four per cent.

The automobile was designed and is being built by Harry W. Summner, of Cincinnati, O., for E. V. Wilbern of that city in which he will take a trip around the world. It will be built on the order of the famous "One Hoss Shay", each party being equal in strength to every other part. The plant of the United States Aluminum Castings Company is located at North Side, Cincinnati, and is thoroughly equipped for turning out large and difficult aluminum castings. In addition to the above mentioned castings, the company recently turned out among other large castings, one weighing 125 pounds for the Pennsylvania Steel Company, to be used for a truck pattern.



Aluminum Crank Case for Automobile.

Parnassus Not Abandoned.

The Champion Rivet Company has not abandoned its intention to locate a plant at Parnassus, as erroneously reported, but is going ahead as fast as possible on the detail work. Owing to the heavy demand for structural material it will be impossible for the company to have work started in the construction of the plant before the spring of 1903. The original plans provided for a plant to cost $500,000. The plans have been revised and call for a plant to cost $150,000. There will be a main building 70x350 feet, machine shop, power house, pickling house and storage rooms. The capacity will be 75 tons of open-hearth steel and refined iron rivets per day. The Eastern trade will be supplied from the Parnassus plant and the Western trade taken care of from the Cleveland plant. Five machines which were to have been installed in the Parnassus plant have been placed temporarily in the Cleveland plant, to which an extension has been made. It is possible that the manufacture of bolts will be taken up at the Parnassus plant, for which an additional building will be erected. The officers of the company are: Wilson B. Chisholm, president; David J. Champion, vice president and general manager; W. C. Winterhalter, secretary and manager of the Pittsburg office in the Arrott building, and Henry Chisholm, treasurer.

Notes for the Chemist.

A Chemical Method for Obtaining Vacua—Francis G. Benedict and Charlotte R. Manning (Am. Ch. Jour., May 1902). The production of a "good" vacuum, especially in desiccating apparatus, is frequently required in a chemical laboratory. Mechanical air pumps, such as are so successfully used in the exhaustion of incandescent light bulbs, are obviously impracticable for ordinary laboratory use; and the valve pump of the physical lecture table is, in general, the most available form of pump for producing vacuum.

In the chemical laboratory one has, as a rule, to be content with the vacuum obtained by means of one of the many forms of water pumps; unless, as is occasionally the case, a mercury pump is at hand. The length of time required to exhaust a vessel by means of the mercury pump is considered so great an objection to its every day use, that the apparatus is commonly allowed to become dirty and unfit for use.

The use of the water pump is attended with numerous difficulties, chief of which is "sucking back" of water, especially toward the end of an exhaustion.

With constant and high water pressure, and otherwise ideal conditions, few, if any, forms of water pump will give a vacuum corresponding to a mercury pressure of less than 10 m. m.

It is more frequently the case, however, that the water pump available at any particular time falls far short of this efficiency, and, indeed, by being so inferior materially delays the drying operation that is dependent on a good vacuum. So far as we are aware, the use of chemical means for obtaining vacua has never been generally adopted. The absorption of a gas or vapor, filling a space, by means of some suitable non-volatile absorbent, is, however, capable of yielding vacua of the highest degree of perfection.

The authors give numerous methods which have been tried for drying in vacua, and give the following method as most satisfactory:

We have found that after expelling the air in the desiccator, the residual vapor is entirely absorbed by the sulphuric acid in the upper chamber, yielding remarkably good vacuum. The exact conditions under which the operation is best conducted are as follows.

Fresh concentrated sulphuric acid, about 150 c. c., is placed in the previously cleaned and dried upper compartment of the desiccator. After introducing the material to be dried (in appropriate containers,) and just before the cover is put in place, 10 c. c. of pure anhydrous ether are delivered from a pipette upon the bottom of the desiccator in such a manner as not to come in contact with the material to be dried. The cover is then carefully put on, the glass stop-cock being left open; immediately the water pump is connected with the tube in the cover and the exhaustion continued until the manometer shows from 40 to 60 m. m. pressure. The stop-cock is then closed, the tube connecting with the water pump removed, and the desiccator allowed to stand. In a very few minutes a vacuum of from four to one m. m. is obtained. This degree of exhaustion may be obtained in about 10 minutes after putting the cover on the desiccator.

In the size of apparatus used in our experiments the lower compartment, representing sufficient space for desiccating, contains 2,100 c. c. This, together with the 1,400, c. c. of space in the upper compartment, when containing 150 c. c. of acid. gives a total gas volume of 3½ liters to be exhausted.

The desiccator used was the well-known Hempel Vacuum Desiccator, (Ziet. angw. chem. 1891-p. 201).

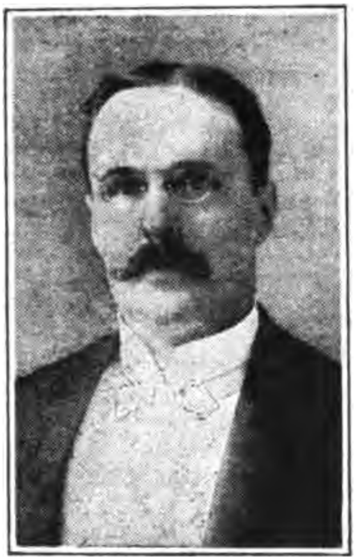
We have found this desiccator to be remarkably tight, vacua of about one m. m. pressure being unchanged at the end of two weeks.

This method is especially adapted for use in a chemical laboratory for (1) the apparatus required is that already in use in many laboratories; (2) the time requirment to secure a good vacuum is reduced to a minimum; (3) no ordinary method will permit of so complete a rarification of the gases in the desiccator.

A Bibliography of the Analytical Chemistry of Manganese, 1785-1900—by Henry P. Talbot and John W. Brown is a recent addition to the Smithsonian Miscellaneous Collections. This forms one of the series of Indexes to Chemical Literature prepared under the auspices of the Committee of the American Association for the Advancement of Science, and recommended by them to the Smithsonian Institute for publication. The periodicals examined number 54, comprising several hundred volumes. It contains a very full subject--index and an author—index.

Burette Floats — Krietling (Ziet. angw. Chem XV, 4) The author has made an exhaustive study of the use of burette floats. He found that both Erdmann's floats and the so-called spherical floats give irregular results compared with the results obtained without the use of a float; this was true with floats of varying calibre and with different burettes. No satisfactory explanation for the irregular results obtained with floats could be found, but the author reaches the conclusion that it is safer to do without the float altogether.

Two furnaces of the Thomas Iron Company's works at Hokendauqua, Pa., have been banked owing to the scarcity of coke.



Arthur W. Walker, (Walker & Pratt Mfg. Co., Boston,) Elected President of the American Foundrymen's Association.

Decision Favors Hansen.

M. J. Hansen, president of the new Standard Steel Car Company, and former chief engineer of the Pressed Steel Car Company, who was made defendant in a suit over some patents that he had designed and applied for in the manufacture of steel cars, while holding his former position, has gained the first point in the legal battle that has been waged against him since his retirement from the old corporation. In the United States circuit court, Monday, Judge Joseph Buffington handed down an opinion in the injunction suit which was instituted to restrain Mr. Hansen from disposing of six patents and applications for patents.

These patents are among the most valued in connection with the steel car building operations, and it is understood that they were to be turned over by Mr. Hansen to the new Standard Steel Car Company that is now building its big works at Butler. The decision of Judge Buffington permits Mr. Hansen to dispose of these disputed patents subject to the final decision of the court in the legal contest.

At the same time, Judge Buffington ordered that the applications for other patents shall be placed in the hands of an attorney from each side of the contest, pending the final granting of the papers at Washington.

The Grafton, (W. Va.) Brick Company, is installing a new plant, and adding several thousand dollars worth of machinrey.

The Burden Company's Officers—At a meeting of the stockholders of the Burden Iron Company at Troy, N Y., June 18 the following directors were elected; James A. Burden, I. Townsend Burden; John L. Arts, James A. Burden, Jr., Williams P. Burden and Arthur S. Burden. A certificate was filed same day with the secretary of state stating that the number of directors of the company had been increased from five to six. At a meeting of the directors the following were chosen: President, James A. Burden; vice president, James A. Burden, Jr.; general manager John L. Arts; secretary, Nicholas J. Gable.

Proposed John Fritz Medal—A movement has been begun to celebrate the eightieth birthday anniversary of John Fritz, of Bethlehem, Pa. It is proposed to establish a John Fritz medal, the award of which is to be placed in charge of a board whose members shall be appointed or chosen by the four National societies, the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Society of Electrical Engineers. The chairman of the general committee is S. T. Wellman, of Cleveland, O.

The offer of $65,000 by the South Penn Oil Company, for the Alex Morrow lease on 100 acres in Wirt county, W. Va. has been refused.

Bellaire, O, will spend $50,000 on the improvement of its water pumping station and the extension of its mains.

J. S. Seaman, Father of the Pittsburg Delegation of Foundrymen.

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EDITORIAL COMMENT.

No Time for Rash Talk—Some of her newspapers are likely to be classed as the deadly friends of those they believe they are trying to serve in discussing current labor troubles. In their zeal in those cases in which they have no personal interest some of the editors are reading out nauseous lessons to the workingmen and lessons which in time will return as vexatious plagues to the writers. Just now they are more or less plague-like in their effects upon the employers of labor whose direct interests are involved in the disputes which have been connected with disorder.

In discussing labor troubles it is just as well to bear in mind that there are few cases which is able to show but one presentable side. The history of labor disputes shows that where the two sides do not balance each other in interest to their respective claimants a balance is so close both sides are willing to forego a point or two and rest with a compromise settlement. It is unreasonable and in some instances actually abusive to assert as some of the daily editors do that the workingmen are always wrong and inciting to riot and bloodshed; and it is just as untrue in fact as it is unreasonable in the probabilities. The workingmen are not always wrong. In the most recent cases in which the editorial brain has taken up the task of showing the gross falsity of the position of the workingmen the issue is defined with sufficient clearness to show that the error is not always on one side and to abuse the general run of workers in general is an absurdity. One of these is the case of the traction employes of Pawtucket, R. I. The military was summoned to assist the civil authorities at a certain stage of the strike and that one fact is taken as the text of so many nauseous sermons on the moral perversity of the workingmen that one is inclined to ask if the employers have not since prayed to be delivered from their fool friends. It is true that there was disorder at Pawtucket and that the military arm of the executive government was summoned to assist the civil wing of authority. The extent of the disorder need not be brought into question since the governor of the state regarded it as sufficient to justify him in complying with the civil demand for greater force.

The foundation fact in the case upon which the later structure rests is that the Rhode Island legislature passed a bill which was approved by the governor, making it a law, specifying that a working day should not exceed 10 hours and providing for its enforcement. That act became operative June 1 and the refusal of the traction companies to honor the law brought about the refusal of the employes to work longer and hence the strike. The traction employes demanded, and rightfully too, that the traction companies respect the law and that the civil authorities compel that respect. Both efforts failed and in the heat of the dispute no doubt some disorder resulted. But the traction companies were the first to disregard the law and display a contempt for it that equalled at least the disregard born of momentary excitement on the part of the men. The strike of the traction employes and the subsequent disorder was due to exactly the same cause.

Following both these strikes to enforce the law editorial writers all over the country leaped into the breach and issued unnumbered articles in which the men were classified as anarchists and general evil doers. After reading a few of the most rabid editorials one is led to wonder that law abiding people are able to live in the same community with safety. These editorials in general have been so fierce that if the employers have not demanded to be saved from their fool friends they should begin to make supplication at once. These editorial utterances have brought the matter out with such vividness that the men have become bewildered and are aksing if laws are made only for the workers: are employers not amenable to the same civil obligations and subject to the same moral forces. For this reason the editorial fools may have a cause for reflection later when it is desirable to impress the public mind with facts on any particular point. It need not be wondered at if the man who has been called an anarchist for attempting to secure the enforcement of a law displays slowness in accepting the utterances of the editorial writers on any other topic.

It is unjust to condemn hundreds of men wholesale as anarchists because they over stepped the bounds of prudence in the disappointment following their hope in the benefits of the

operation of a law passed by a legislature and approved by a governor for their particular benefit. It is this reckless indiscriminate use of the term anarchist which has caused greater trouble than would otherwise have resulted.

The American workman is not an anarchist and the great mass of employers of labor will unquestioningly so affirm. The American workman has few if any peers, physically, morally, or mentally and while bloodshed is to be condemned, there should be more discrimination in the criticism of the conduct of strikers. The moral effect is bad. Strikes in themselves are bad, but there is more evil in the danger of even lending the impression to the workers that they have no rights, no privileges which any one is bound to respect. Once let the editorial writers convince the workingmen of the United States that they have no hope in the future and there will be such a condition as will surprise even a pessimist. And let the workingmen understand that they are to be classified as anarchists and be placed at the mercy of a lot of unfledged militiamen for attempting to secure operation of an act which is just as binding as any other (else why pass and approve it?) and a new cycle o public opinion will be encountered which will astonish the man whose occupation prevents him from coming into contact with the general run of workingmen. It is sufficient to condemn riot and bloodshed without adding personal abuse.

Personals.

J. K. Holloway, of Cincinnati, O., has severed his connection with the Fosdick & Holloway Machine Tool Company, of that city, on account of ill health. The firm name will be changed to the Fosdick Machine Tool Company with Phillip Fosdick, president; and A. F. Richardson, secretary and treasurer. The company is engaged in the manufacture of radial drills.

Charles R. Roof, superintendent of the Youngstown Manufacturing Company, Youngstown, O., he resigned his position. Mr. Roof and others are now engaged in the work of organizing a new bolt company, and it is possible that it will be located in or near Youngstown. The company will have a capital stock of $200, 000, and a good part of it has already been subscribed. The new plant will be modern and up-to-date, equipped with the most approved and latest designed machinery and appliances and will be able to meet all competition.

The C.C.C. and St. Louis Railway Company will build new round houses and repair shops at Cincinnati, Springfield and Delaware, O. Contracts for the building have been let.

OBITUARY.

WILLIAM SWINDELL—William Swindell died suddenly of heart failure at his residence, 2220 Perrysville avenue, Friday June 20. He was born in Allegheny February 15, 1834, and was always active in the development and growth of both cities. He was known as the pioneer furnace builder from his long connection with that craft, and in 1879 was elected a member of the American Institute of Mining Engineers. He was president of the firm of William Swindell & Brothers, and was the inventor of numerous improvements of regenerative gas furnaces and gas producers that are in use in all the big steel mills of the country.

Altogether he took out 85 patents on as many inventions. He was among the first builders here in the early days of steel works as an agent for Siemens & Company, of England, and during the Civil war had charge of the furnace equipment of the Ft. Pitt Foundry, where many of the large cannons used by the Federal army were made. In after years he kept pace with the growth of the steel industry and took a keen interest in its development, his methods being adopted as the standards now in use in this country and Canada.

Mr. Swindell was a member of Allegheny councils for 17 years, but retired from politics 10 years ago. He is survived by a wife and two children, Mrs. Wesley W. Wolfe and Edward H. Swindell, secretary of the firm of Swindell & Brothers.

CHARLES T. CHILD—Charles T. Child, technical editor of the "Electrical Review" of New York, died Monday this week at Gleasondale, Mass., of typhoid fever. Mr. Child, who was but 35 years old, was a widely known writer on electrical and scientific subjects in this country and abroad.

S. Diescher & Sons, Hamilton building have just completed plans for the new plant of the Franklin Rolling Mill & Foundry Company at Franklin, Pa., and will ask bids for the erection and equipment within a few days. The mill building will be 75x330 feet, boiler house 50x60 feet and foundry 100x100 feet, all of steel structure. The power house will be equipped with a 600 horse power engine, 600 horse power boilers, heaters, pumps, etc. There will also be a 100 horse power electric light plant installed. The rolling mill plant will consist of three stands of three-high 18-inch mills. Among the machinery needed will be a number of bolt making machinery, nut tapping machines, cold cutting saws, small hand crane, pulleys, shafting, etc.

IN AND ABOUT PITTSBURG.

Victor Beutner, of this city, who designed the new plant of the Susquehanna Iron & Steel Company, Columbia, Pa., has given the contract for several furnaces and eight gas producers to the Forter-Miller Engineering Company, of this city. The contract for the engines went to the engineering department of the Pittsburg Gage & Supply Company, for one pair 600 h. p. Brown Corliss Engine Company, (Corliss, Wis.) two engines to drive direct connected electric generators at 136 R. P. M.

The Pittsburg Gage & Supply Company also secured orders for one complete "White Star" filtering system for the new plant of the Westmoreland Light & Power Company, Greensburg. Another order was from the Hooven, Owens & Rentschler Company, Hamilton, O., for supplying two cross compound engines with "White Star" filtering system intended for the power plant of the Cincnnati, Georgetown & Portsmouth Railway Company.

The plant of the Fort Pitt Malleable & Gray Iron Company, at McKees Rocks, was placed in operation last week and is running to its fullest capacity. The plant is equipped with the latest appliances for foundry work, having a capacity of 75 tons daily. The building is 170x400 feet, with a saw-tooth roof. The company has 11 acres of ground and has under consideration the building of an addition for the manufacture of steel castings. The company is composed of J. C. Riley, president; M. J. McMahon, vice-president; Frank J. Lanahan, secretary and treasurer; E. S. Riley, general manager; and John Ryan, foundry superintendent, who with H. G. O'Brien and C. F. Holdship, comprise the board of directors. Main offices are in the Shannon building, this city.

The Fort Pitt Bridge Company, of this city, has received the contract to erect the buildings for the United Steel Company, Canton, O., which has been organized by various stockholders of the Star Rolling Mill Company, Carnahan Tin Plate Company and the Berger Manufacturing Company all of Canton. The contract calls for an open hearth building 100x300 feet, rolling mill 50x300 feet, boiler house 40x80 feet and a producer house 30x140 feet, all to be of steel structure. The plans for this plant were designed by Victor Beutner, Westinghouse building. Other contracts will be awarded some time this week.

With slight modifications the Wheeling scale has been agreed upon by the officials of the American Sheet Steel Company and the Amalgamated Association which means that the Amalgamated men employed by the American Sheet Steel Company will for the coming year be given the pay as outlined at Wheeling. The new scale, as mutually agreed upon, will be in force for one year after June 30. The conference on the tin plate scale will be held at New York June 30.

New machinery is being installed and present equipment reset at the iron works of Chester B. Albree, Allegheny, providing better facilities for handling the products of the plant and an increased capacity. The demand for pneumatic riveting machines is reported strong and the structural iron department is being operated to its capacity. Included in the new equipment is a 1,500 pound Chambersburg steam hammer, and 80 horse power Erie economic boiler and a large heating furnace in the forging department.

The West Penn Foundry & Machine Company at Avonmore has begun an addition of 250 feet to the present building. When this addition is completed it will make it one of the largest shops in the state. The shop is now engaged on a $200,000 order for the Columbia Glass Company, at Blairsville and an eight-mill plant at Pueblo, Col., altogether with other work on small orders.

The Phoenix Steel Wire Company, limited, has made a number of improvements by putting in some new machinery for polishing and straightening steel rods. The company has just closed a large contract with the United States government for "Phoenix" polished drill rods. The Nickel finish steel rods are growing in popularity among the typewriter companies who are using them instead of the nickel plated stock.

James F. Morrison, boiler and tank manufacturer, Water street, this city will have work begun this week on his new plant to be built at Grant and South avenues, Allegheny. The building will be 100x155 feet, equipped with the latest improved appliances for the manufacture of boilers, tanks, and sheet metal work, and will provide a capacity more than double that of the present plant.

The New Castle Pottery Company, New Castle, at a meeting held lately, decided to add $50,000 additional to the capital stock of the concern, this amount to be expended in the making of improvements and enlarging the capacity of the plant. New kilns are to be built at once and many other new buildings are to be constructed.

The Ellwood City plant of the American Tin Plate Company is being dismantled. The machinery is being shipped to different points, where a portion is needed, but the greater part will go to Monessen, as that plant is being greatly enlarged.

The Keystone Valve & Manufacturing Company, of this city, mention of the incorporation of which was made in these columns some time ago, has secured 20 x 110 feet in the rear of 2626 Carson street, South Side, and will start work at once upon a two story building to cover the ground secured. Part of the plant will be used as a brass foundry and the balance as a machine shop, the equipment for which is being purchased.

The Redding Engineering Company, with works at 3173 Second avenue, this city, has located its main office in room 39 Schmidt building, this city. The company furnishes complete power plants. It has recently acquired the exclusive agency for the Pittsburg district, for the National Water Tube Boiler Company, of New Brunswick, N. J.

The stockholders of the Bovaird & Seyfang Manufacturing Company, Bradford, have elected officers as follows: President, O. D. Bleakley of Franklin; vice president, James E. Cochran of Bradford; general manager, James E. Cochran; treasurer and purchasing agent, J. E. Ward of Bradford; secretary, R. H. Lee, of Bradford.

A seven kiln pottery is to be built by W. J. Harvey and others of New Castle from plans prepared by H. M. Wirsing of New Castle.

NOTES OF THE INDUSTRIES.

The plant of the Miller Improved Gas Engine Company at Springfield, O., has been completed and machinery is being rapidly installed. The company expects to have its new plant in partial operation in another week and will then begin the removal of the machinery from its temporary works in the East street shops. The new plant is 75x400 feet, of brick construction and will be equipped with modern appliances throughout, including an electric traveling crane. A switch connection has been made with the "Pan-handle" railway. The product of the plant will be double cylinder gas engines up to 250 horse power. An output has been provided for in the new plant double that of the plant which was recently burned.

The Chicago Pneumatic Tool Company though its Pittsburg office, has secured the contract to furnish the William B. Pollock Company, Youngstown, O., with a 1,600 foot cross compound steam and compound air compressor, of the Franklin type. The company has just started shipment on its order of 200 pneumatic tools the Standard Steel Car Company of this city. The order comprises the entire pneumatic equipment for the company's plant at Butler, Pa., and consists of 150 "Boyer" long stroke riveting hammers and 50 "Boyer" pneumatic rammers.

The Ella and Fannie furnaces at West Middlesex, Pa., have resumed operations, a settlement having been made with the striking employes. The men were granted a 10 per cent advance, and laborers were conceded a nine-hour day instead of 10 hours. The Sharpsville, Alice, Mabel, and two stacks of the Snyder Furnace Company, at Sharpsville, also resumed operation

At a recent meeting of the directors of the William Tod Company, Youngstown, O., was decided to materially enlarge the plant. Among the additions made will be a new erecting shop, 70-foot crane span and 70 feet high by 200 feet long, provided with two 50-ton cranes with 10-ton auxiliary hoist: an additional machine shop, 50-foot span, 50 feet high by 200 feet long, which will also be equipped with proper crane capacity: a forge shop 30x150 feet, and a new boiler plant.

It is announced that the cold roll mill and the sheet mill of the Falcon plant in Niles, O., are to be removed to Struthers, O., and be made a part of the works now operated by the American Sheet Steel Company. With the sheet and cold roll mill away from Niles the skelp and puddle mills of the Falcon mill will still remain there, and they will likely be operated by the American Steel Hoop Company.

The establishment of the Hoffman Hinge & Foundry Company, Cleveland, O., was destroyed by fire last week. The building contained much valuable machinery and a large quantity of stock was stored there. The engine room, from which power was supplied to the building occupied the basement, and the engine was damaged beyond repair.

A company has been organized at Jonesboro, Ind., by Messrs. J. M. Beavo, James L. Elston, N. J. Cappock and others with a capital stock of $300,000 for the manufacture of tin plate. It is understood that the plant will consist of eight mills. The size of the buildings have not yet been determined but bids will be wanted for the construction and equipment of the plant within a month.

Ground has been broken for the new steel machine shop of the Empire Shipbuilding Company, Buffalo, N. Y. The work of construction will take about two months. The shop will be equipped with modern machinery for the heav-

iest work, and will be operated with Niagara Falls electric power.

The Peerless Electric Company, with a capital of $500,000, has been organized at Warren, O., to build a large electric manufacturing plant. The incorporators are T. H. Gillmer, E. A. Gillmer, W. C. Ward, Jacob Perkins, E. E. Nash, William Wallace and J. W. Holloway all of Warren.

Hamilton Furnace, Ironton, O., is shut down, caused by the general strike of the miners. The furnace made its last heat last week when the supply of coke became exhausted. The company will make all necessary repairs, and a number of improvements.

Frank H. Buhl and P. L. Kimberly of Sharon, Pa., are arranging to build one of the biggest coking plants in the country. For more than a year past they have been jointly interested in Kentucky coal lands owning 100,000 acres.

The construction of the buildings of the Empire Iron & Steel Company's plant at Niles, O., is presently moving along with considerable rapidity. Work in every part is being hurried so that the mill may be in operation at very early date.

The Superior Gas Engine Company, Springfield, O., is completing its new machine shop and foundry and will have it ready for operation in about six weeks. The company will about double its present output upon removal.

The Emaus furnace, at Emaus, Pa., has gone out of blast for want of a supply of coal. It is stated that the Donaldson Iron Works can not get pig iron, and will likely be compelled to suspend operations.

The Susquehanna Steel & Iron Company, Columbia, Pa., has posted a notice that puddlers will receive $4.50 a ton, an advance of 25 cents, the wages of other employes to be adjusted.

The large wire mill at Lambertville, N. J. has been completed, and machinery for the manufacture of wire novelty goods for a Philadelphia concern is being installed.

Alterations and additions are to be made to the machine shop of the Link Belt Engineering Company at Nicetown, Philadelphia, Charles Barton Keens is the architect.

The Pottsville Iron & Steel Works, Pottsville, Pa., idle for five years, will be placed in operation by a syndicate formed by Pilling & Crane, of Philadelphia.

The New Steel & Iron Company, capital $100,000, has been incorporated by John B., Horatio C. and Arthur M. Wood. The plant is located at Hackettstown, N. J.

Harry H. Light, and Simon P. Light of Lebanon Pa., who are the principal owners of the Nroristown, Pa. Iron Mills, will move the plant to Lebanon.

Representatives of the United States Radiator Company, of Dunkirk, N. Y., were in Camden, N J., recently looking for a 10-acre site for their plant.

The Muncie Gas Engine & Supply Company, Muncie, Ind., will enlarge its shops.

NOTES OF THE SOUTH.

The report of the Southern Iron Committee for the month of May, 1902, showing shipments of pig iron, steel and cast iron pipe last month, has been made public. The total shipments of the commodities named amounted to 169,739 tons of which 152,174 tons were pig iron and steel and 17,565 tons cast pipe. The shipments of pig iron by district were as follows: Anniston, 21,857 tons; Birmingham, 77,548; Nashville, 8,710; Sheffield, 16,248; Middlesboro 3,383; Chattanooga, 4,428, total 152,174. The cast iron pipe shipments were as follows: Anniston, 4,942 tons; Birmingham, 7,716 tons, Chattanooga, 4,907 tons, total 17,565 tons. The expert movements during May were as follows: pig iron 230 tons; cast iron pipe 331 tons. The steel shipments last month, all of which went from Ensley amounted to 11,259 tons.

There is a good demand for finished iron and steel and as a consequence there is much work being done in the rolling mills. Indications are good for steady work through the summer, provided the men want to remain at the rolls during the hot weather. The tubing works at Helena are working steadily with a fair demand for their product. The cast iron pipe manufacturers have no reasons to complain. The products of the Alabama Steel & Wire Company are in good demand and there is plenty of work going on at that institution.

The stocks of raw material at the furnaces in this state are greater now than ever before, coal especially being laid in so that the production of pig iron might not be disturbed in case the coal miners, who are now holding their scale convention can not come to an agreement on a new scale for the ensuing year. The present contract with the miners expires July 1 and

there is no telling what may happen. A supply of three or four weeks in coal is being laid in at several of the furnaces while the coke ovens will have a good supply also, to be used in case of emergency.

The production in Alabama has been improved some by the blowing in of the new furnace of the Republic Iron & Steel Company, at Thomas. The iron, however, is not going on the regular market but is being used by the company manufacturing it. The furnace of the Sloss-Sheffield Steel & Iron Company in the city which has undergone a thorough repairing is ready for the torch. The furnace will be in blast perhaps between the first and 10th of July, if not sooner.

The Alabama Consolidated Iron & Coal Company is planning to practically rebuild the Gadsden furnace, adding greatly to the capacity of the furnace. A report was current that a new furnace will be erected by that company at Gadsden but this, officials say, is a mistake and the old furnace will be rebuilt.

Shipments of iron and other metals from this district are heavy. A railroad official says that the shipments are steady and that as many cars as is desired in the handling of the traffic is being furnished the furnacemen. No trouble whatever is being experienced because of the scarcity of cars at present.

There are some good shipments of low basic iron being made from this section to Western steel manufacturers. This iron is in good demand and all is being shipped as quickly as it is made.

IN THE CINCINNATI DISTRICT.

The R. K. LeBlond Machine Tool Company is building an addition to its plant to be used as a power house and extension to its blacksmith shop. The company is installing a Sturtevant generating set, comprising a 50 horse power engine and 50 k. w. generator. In the blacksmith shop two case hardening furnaces are being built. A number of new tools were recently installed in the machine shop, including two Cleveland automatic screw machines, a planer, six lathes, milling machines, etc. The company is preparing to place on the market a line of hydraulic arbor presses.

Plans are being prepared by the Block-Pollak Iron Company, Carthage, O., manufacturers of car axles and heavy shafting, for a large addition to its shape work department. The size will be sufficient to treble the present output of shafting and equipped to turn out shafting up to 50 inches in diameter and 40 tons in weight. Included in the equipment will be a 15 ton steam hammer and an electric traveling crane. The company recently completed a large addition to its machine shop and is preparing to increase the output of the department by the addition of new machinery.

Robert E. Sweeny and George A. Von Hagel, proprietors of the Columbia Iron Works, this city, have their new plant, on Reading road, in partial operation, and expect to have it in full operation in another week. They have demonstrated their capacity to handle work with despatch by constructing their own plant, 100x130 feet, in 15 working days. They will make a specialty of ornamental and structural iron work.

Twelve additional furnaces were placed in operation this week at the plant of the Edna Smelting & Refining Company. In all 21 furnaces are in operation.

The Monarch Foundry & Machine Company plant at North Side, Cincinnati, recently put in operation, may receive an extension to be used as a machine shop. Included in the equipment will be pulley lathes and boring mills for the manufacture of pulleys. The company has a modern equipped foundry for truning out light grey iron castings and carries on a jobbing business in foundry and machine work, as well as the manufacture of the Monarch smoke preventer, several of which are in successful operation in this city. The company is composed of Gilbert L. Vattier and G. W. Gary.

The Rapid Tool & Machine Company. manufacturers and designers, has completed the removal of its works from Main street to 814-818 Broadway, this city. The company has added materially to its equipment and doubled its former capacity for the designing and building of special machinery, tool and die making, metal spinning, stamping and forming, electrical and mechanical experimental work etc. The plant is equipped with the newest types of machinery.

The Limberg Enameling Company, of this city, has secured the building and equipment of the Enterprise Foundry Company to which it will put up an addition and remove its present works. In addition to making castings for its own use in the manufacture of sanitary supplies, it will carry on jobbing foundry business. The company will double its present output upon its removal.

Christopher Roos, formerly with the Cincinnati Punch & Shear Company and A. Mill, M. E. formerly draughtsman with the Bickford Drill & Tool Company, this city, have formed a company known as Roos & Mill for the purpose of manufacturing radial drills and special machinery. They have secured temporary quarters at 2008 to 2012 Central avenue, this city, which they are equiping with machinery. A new plant will eventually be built. Patterns are being completed for the first lot of four foot radials which will be ready for the market in about four weeks.

The Owen Machine Tool Company, of Springfield, O., has been reorganized and incorporated under West Virginia laws with $100,000 capital stock by William H. Owen, William S. Wilson, George Marx, Edward Hasford and John A. Reid. The company manufactured milling machines in part of the large East street shops at Springfield, at the time the shops were burned in January. It is completing a new plant at Springfield which will be ready for operation in a few weeks.

The Cincinnati Shaper Company has completed plans for the plant it will build in the West End, and will break ground this week for a one story building 90x290 feet, to be used as a machine shop, and a two story office building. The plant will be completed and ready for operation by October, providing an output double that of the present plant. The company will increase its capital stock to $85,000.

The Xylotite Manufacturing Company, this city manufacturer of "Xylotite" pulleys, a composition of wood fibre and other materials, recently placed its plant in operation and has decided upon the erection of a four story addition, plans for which are being prepared.

The Medina Foundry Company, Medina, O. has been incorporated with $15,000 capital stock by F. O. Phillips, Arthur Van Epp, H. C. Beadway, C. C. Engel and Blake McDowell.

WEST VIRGINIA NOTES.

The secretary of state has chartered the Greenbrier, Monongahela & Pittsburg railroad, which purposes constructing a road from Marlington, Pocahontas county, to Point Marion, on Cheat river, thence to Pittsburg over a route surveyed long since by the Guffy interests. The new company's incorporators are: J. T. McGraw, Melville D. Post, A. S. Warder and George M. Whitescarver, of Grafton. The capital stock is $500,000 and the road no doubt will be built at the earliest possible moment as there is ample wealth back of it.

The real and personal property of the Watson-Loy Coal Company, at Barnum, W. Va., on the West Virgina Central railroad has been sold to Watson, Dodson & Company, of Bethlehem, Pa., for $215,000. The sale includes 1,700 acres of coal besides the plant and machinery.

The Mountain State Gas Company of Sistersville and allied Standard oil interests are preparing to pipe gas from that field to Dover, Del., and to points in Ohio. The project will be the biggest one of the kind recently undertaken.

About $50,000 will be put into the Kennedy box works to be erected at Grafton, W. Va. Among the men leading in the deal for site are R. W. Kennedy, John Ruhl, Thomas J. McAvy, and O. P. Stroh.

The Grafton Gas & Electric Light Company as decided to install a 120 k. w.electric generator; a 200-horse power engine and a 150-horse power boiler, besides enlarging the plant otherwise.

The Grafton Foundry & Machine Company, at Grafton, is being organized. The following committee has been appointed on machinery and buildings: H. M. Leps, T. H. Cather, and C. S. Jones. The company expects to put about $20,000 into its plant.

At Fairmont the proposed bond issue of $88,000, $30,000 of which will be expended on the extension of the mains and the installation of a new sewer system has carried and the city authorities have been instructed to make contracts as soon as possible.

The Tygarts River Lumber Company, which purchased 10,000 acres of timber on Mill creek in Hampshire county is building six miles of standard gauge road to it from Mill Creek on the West Virginia Central.

The Riverside Bridge Company, of Wheeling has bought ground at Martin's Ferry, O., for an addition. Among the new contracts secured by the company the past week was one for a large bridge near New Martinsville.

The Fostoria Glass Company is making many improvements on its Moundsville works. Several departments are being enlarged and the output of the plant very materially increased.

John C. Monark, of Lynn, Mass., has secured ground at Weston for a carbon factory. No plans have been drawn.

IRON AND STEEL TRADE, PRICES AND CONDITIONS.

Pittsburg—The problem of furnishing deliveries about makes up the market situation, as the time for buying has about passed for this year except for an occasional small lot of no moment.

How best to maintain operations that will clear the books of the tonnage desired for 1902 delivery is the whole case now and the producers are bending their energies to that end. From the present outlook it looks as if the producers were attempting the impossible in trying to deliver the fall tonnage contracted for.

The pig iron producers state that new tonnage is out of the question and that it is no longer offered. If it were it would not be considered. The current quotations of the valley merchant furnaces this week is from $21 to $22 per ton at stack. The foundry grades are as scarce as ever and higher prices are paid for prompt iron than for Bessemer and mill irons.

The plate and bar demand is still growing but in sheets and tin plate there is less urgency in the calls for material. The sheet producers are so well filled up however that the modification in the demand at present is immaterial, but in the tin plate trade the demand has dropped down to a mere shadow, a situation that is more or less disturbing to the management of the tin plate plants. On the whole there is no actual change except for a possibly greater effort to produce and hurry forward shipments. Prices are not hardening but the tendency is still toward a higher point.

CURRENT QUOTATIONS:

Basic	$20 50	22 75	Splice bars	1 50	
Bessemer		22 75	Angles	1 60	
Charcoal, hot	32 00		I beams	1 60	
Charcoal, cold	32 50		T beams	1 60	
Fdy, Nhn		19 50	Z beams	1 60	
Fdy 2, Nhn		19 25	Channels	1 60	
Fdy 3, Nhn		18 50	Boiler plates	1 75	
Mill Iron	19 25		Fire-box	1 85	
Fdy 1, Shn	19 50		Sheared	1 65	1 75
Fdy 2, Shn	19 25		Tank	1 69	1 7[illegible]
Fdy 3, Shn	18 75		Steel melt'g scrap	18 50	19 00
Grey Forge, Shn	18 60		No. 1 wrought	20 00	20 50
Bessemer billets	36 00		No. 1 cast	17 00	17 50
Open hearth	37 00		Iron rails	25 00	2[illegible] 00
Steel bars	1 80		Car wheels	18 00	19 00
Iron bars, refined		2 10	Cast borings	10 00	10 50
Light rails		37 00	Turnings	13 00	14 00
Standard sections	28 00		Sheets, 26	3 00	
Bolts, iron, sq nut	2 50		Sheets, 27	3 10	
Hex nuts	2 65		Sheets, 28	3 20	
Spikes	2 00				

Philadelphia—As compared with a week ago the local pig iron market has gained further in firmness, and the continued difficulty of commanding prompt deliveries has stiffened prices to some extent. At the present time the great scarcity of metal is the dominating feature, and it is especially effective because of the unprecedented exhaustion of stocks. All grades of iron are equally scare, and it naturally follows that prices are irregular. In a general way they are about as follows for Philadelphia and nearby points, for deliveries during the last quarter of this year, with 50 cents to 75 cents additional for July, August and September shipments: No. 1 foundry, $23 to $23.50; No. 2 foundry, $21.50 to $21.75; gray forge $19. to $19.50.

The arrivals of foreign steel billets appear to have filled the urgent needs of consumers, as the demand at present is not so strong as it was. Nominal quotations for American steel are $34 to $34.50 for deliveries late in the year. Foreign steel continues to be quoted at $30 to $31.50. Manufacturers of finished iron and steel seem to be having it all their own way at the present time. Plates are in good demand at full price and deliveries a long way behind in most case , and as regards structural steel there seems to be no limit to the calls for material. Considering that this is the dull season for sheets the demand is fair. The resumption of work at the mills in the Harrisburg district will increase the supply of bars, so that buyers are disposed to look for easier prices in this line in the near future.

CURRENT QUOTATIONS:

Foundry, 1	$21 50	22 50	Girder rails	32 00	32 50
Foundry, 2	20 50	21 50	Angles, 3" & lr'gr		1 80
Gray Forge	19 00	19 50	Under 3-inch		1 90
Bessemer billets		34 00	T's 3" and larger		1 85
Open h'rth bil'ts	35 00		Under 3-inch		1 90
Steel bars	1 70	1 80	Heavy plates		1 80
Refined iron bars	1 90		Beams and chanls		1 85
Standard rails	28 00				

Chicago—The main interest of the pig iron market continues to center in the early months of 1903. There is perhaps an increasing scarcity of spot iron but this is accepted as a matter of course. The users whose regular source of supply for any reason fails them are either compelled to scurry around for substitute iron or close down temporarily. Both alternatives have been practiced. Spot iron is more difficult to obtain than a week ago. The demand is perhaps no greater but the supply seems to be decreasing. Sellers of a week or two ago are out of the market. The tone of the pig iron market continues upward. Prices are irregular, a divergence of $1.50 being sometimes noticeable for the same grades and deliveries. The average quotation is perhaps a little higher than a week ago. Inquiries of the first half of 1903 are increasing but actual transactions are not gaining. The prospective buyers are not well pleased with quotations. It is reported that the freight rates on Southern iron will advance in January at least 50 cents per ton.

There is only moderate activity for finished material. Almost every product is selling in

small lots for whatever deliveries are obtainable. Specifications are excellent and the consumers are arranging for a continuation of their late activities. Rails are quieting down but quite a tonnage of structural shapes is being bought for next year's shipments and store trade is keen, even in lots as high as 400 tons. There is a somewhat brisker inquiry for iron bars on account of the early closing of mills for repairs.

Old material may be slightly weaker, but the decline in prices if any is not quotable.

Offerings are somewhat larger but concessions are not an accessory of these offerings.

CURRENT QUOTATIONS:

Bessemer	22 50	23 00	Sheets, 26 store	3 25	3 40
Fdry Nohn 1	21 50	23 00	No. 27	3 35	3 50
Northern 2	21 00	22 50	No. 28	3 45	3 60
Northern 3	20 50	22 00	Angles	1 75	
Southern 1	20 65	22 65	Beams	1 75	
Southern 2	20 15	22 15	Tees	1 80	
Southern 3	19 65	21 65	Zees	1 75	
Forge	19 15	20 65	Channels	1 75	
Charcoal	23 00	23 50	Steel melt'g scrap	18 00	19 00
Billets, Bessemer	33 00	34 00	No. 1 r.r. wrought	21 00	22 00
Bars, iron	1 80	1 90	No. 1 cast, net ton	15 00	15 50
Bars, steel	1 75	1 85	Iron rails	24 00	25 00
Rails, standard	28 00	30 00	Car wheels	20 00	21 00
Rails, light	34 00	40 00	Cast borings	9 00	10 00
Plates, boiler	1 90	2 00	Turnings	13 50	14 00
Tank	1 75	1 80			

Cincinnati—The movement of pig iron has been materially hampered by the miners' strike, but there has not been an extensive demand. The call for small lots, though, for immediate and early delivery has been very pressing, and the result has been a further advance in prices. There has been some inquiry from large buyers regarding supplies for the first half of next year but it has been to ascertain how much below present prices furnaces would accept contracts. They found that very material concessions would be granted, and it is said that a few contracts have been closed.

For finished iron and steel there is no weakness anywhere and some products are higher from store.

Quite an inquiry for standard steel rails of next years' needs is reported in this market. Heavy wants are anticipated. Light rails have advanced. All kinds of old material are in good request. Prices are rather feverish and irregular.

CURRENT QUOTATIONS:

South. fdy. 1	20 75	$21 00	Standard Sections	29 90	30 90
South fdy. 2	20 25	20 50	Sheet, 26	3 40	
South. fdy. 3	19 75	20 00	Sheets, 27	3 50	
South. fdy. 4	19 25	19 50	Sheets, 28	3 60	
Grey forge	19 25	19 50	Angles, 3 to 6 in	1 70	
Mottled	19 25	19 50	Angles, 1¼ to 2½	1 82	
South 1, soft	20 75	21 00	Beams and Chanl 15 in and under	1 70	
South 2, soft	20 25	20 50	I b'ms 18, 20 24 in	1 80	
L. Superior, fdy. 1	23 00	23 50	Tees	1 75	
L. Superior, 2	22 00	22 50	Z's	1 70	
L. Sup'r char'l c w	23 00	21 00	1 wrought scrap	19 00	20 00
Hang'g r'k ccl, 1			Steel mlting stock gross ton	16 00	
Sohn ccl c w			No. 1 cast	18 00	
Jaksn cy. silv'y 1	22 00	22 50	Old iron rails g t'n	22 00	
St'l brs base hlf ex	1 72		Old car wheels	20 00	
Iron bars	1 82		Cast borings	6 50	9 00
Flange plates	1 80		Turnings	12 00	
Tank steel	1 70				
Ordinary fire-box	1 90				
Light rails	39 00				

Birmingham—There is a steady shipment of pig iron and kindred metals from this district and the indications are that the shipments will equal the production for the balance of the year. There is some apprehension that a difference as to a new contract between the coal miners and operators may cause some hesitation in the iron production in this state, though preparations to prevent any banking of fires at the furnaces are being made by the stocking of coal in the bins and stock houses at present. The new scale of wages for the miners is being discussed by the operators and there is no telling what will be the result of the conference. If there is no labor trouble every bit of iron that can be manufactured in this district during the balance of the year will be shipped almost as rapidly as it can be loaded on to cars.

There is no inclination on the part of Alabama iron manufacturers to consider 1903 business as yet. It is announced, though, that as soon as the mining wage scale has been settled on orders for 1903 iron will be considered. It is believed further that as soon as this business is under consideration that within a very few weeks a mean proportion of the make for the first six months will find a demand. The consumption is great and the indications for several months in the coming year are bright.

Railroad officials state that a large number of billing orders have been filed showing that shipments of pig iron and other products from this section will be brisk for some time to come.

The larger iron manufacturing concerns in this section have sold ahead pretty well for the entire year and a statement has been made that some of them will be pushed in filling orders already on the books. The smaller concerns in this district have been selling small lots of iron at a fairly good premium, sales having been made, it is stated, at $18 and even higher for No. 1 foundry. The railroads are supplying all the cars necessary in moving the product of the furnaces and mills at the very earliest moment. The raw material supply in this section is keeping up with the production and the furnaces are losing no time on this account. Labor agents lately have been bringing into the district quite an amount of labor to take up work around the plants.

CURRENT QUOTATIONS:

No. 1 fdy, Sohn	$17 50	18 00	Tank	1 80	
No. 2 fdy, Sohn	17 00	17 50	Steel smelt'g scrap	14 00	
No. 3 fdy, Sohn	16 00	16 50	No. 1 wrought	14 00	
Grey forge, Sohn	15 50	16 00	No. 1 cast	12 00	
Billets	28 00		Iron rails	16 00	
Iron bars	1 70		Car wheels	15 00	
Steel bars	1 70		Cast borings	6 00	
Light rails	38 00		Turnings	6 00	
Angles	1 75		No. 26 sheets	3 00	[illegible]
Boiler plates	1 90		No. 28 sheets	3 10	[illegible]
Fire box	2 00				

Coal.

Pittsburg—The movement of coal lakeward is better and the supply of cars for purely local transportaton as also much improved. The outlook for the season's activity is better than at any time since lake navigation opened if the labor troubles are excepted.

Cleveland—The coal situation is quiet and the outlook, while brighter, is not now encouraging. It is true that the coal shippers are sending forward much larger quantities than heretofore, but the movement is not normal yet.

Cincinnati—While there is no immediate cause for a scare coal dealers are by no means assured of how things may look two weeks from now. There was a slight ray of hope when the indications were that there would be rain enough to make a rise in the Kanawha river. There is practically no coal for sale afloat and but a moderate amount in the elevators and yards. Beside this the receipts by rail are rather light on account of the strike trouble and the stocks are not being added to. The demand is also quite light and it is calculated that were there to be no additions to the stocks of coal the present supply would last for two or three weeks.

Chicago—The buying of steam coal against a possible strike next month has been resumed and in larger volume than before. Almost every consumer of any note is trying to store up a quantity fuel against the possible tie-up and dealers also have taken the cue and are adding their orders to the total. Hence the Western producers have a much larger business at their disposal than they can care for. They are not getting out the full capacity of mines for the car supply is wholly inadequate. Many of the cars are not used to store coal, though the rule is for the fuel to be dumped upon the ground, usually in the open. Some of the Western roads can afford to stock up in cars and even with them this process may be temporary. Prices are firmer and some products have advanced from 10 to 15 cents per ton. Eastern coals are coming forward very slowly and they too are very strong in tone. Coke is scarce and higher. The only fuel that seems ample is anthracite, of which there are estimated to be in Chicago nearly 300,000 tons, including the holdings of suburbs and individual yards.

The Clark Coal Company has opened its new mine at Wilsonburg W.Va. and is shipping coal.

The production of coal in the North Fork district of the Norfolk & Western indicates that the site there is not keeping up to the notch.

Coke.

A summary of the Connellsville region for the week shows 20,608 ovens in blast and 678 idle.

The following figures show the scope of operations.

Production for the week	243,621 tons.
" last week	247,462 tons.
Decrease	3,841 tons.
Shipments—	
To Pittsburg and river points	3,900 cars.
To points West of Pittsburg	5,140 cars.
To points East of Everson	2,936 cars.
Total	11,976 cars.
Last week	12,221 cars.
Shipments in tons for week	245,508 tons.
" " " last week	251,060 tons.
Decrease	5,552 tons.
Masontown Field	
Shipments for week	520 cars.
" last week	585 cars.
Decrease	65 cars.
Shipments in tons	13,520 tons.
" last week	15,210 tons.
Decrease	1,690 tons.

Coke Prices.

Pittsburg—Furnace, \$3.00@3.25. Foundry, \$3.25@3.50.
St. Louis—Connellsville, \$5.25@5.50. West Virginia, \$4.25@4.50
Cincinnati—Connellsville, \$5.00@5.25. Kanawha \$4.60 Stonega, \$4.60

Petroleum Production.

The production of petroleum in the different fields is shown in the appended tables. The figures include the shipments and runs in detail up to and including June 23, 1902:

Pa., N. Y., Eastern Ohio and W. Va.

	SHIPMENTS.	RUNS.
Transit	684,646	331,654
Tidewater	186,469	70,428
Southwest	88,072	220,069
Eureka	27,043	735,546
Buckeye, Macksburg oil	16,785	287,285
New York Transit	342,751	
Southern	536,060	....
Crescent	175,397	....
Total	1,957,961	1,652,112
Daily averages	88,999	75,096
Buckeye / Indiana Local Division	1,315,299	1,213,524
Daily average	59,786	55,160

PRICES—CRUDE.

	Tiona.	Penna.	Barnesville.	North Lima.	South Lima.	Indiana.
June 18	\$1.35	\$1.20	\$1.20	\$0.88	\$0.83	\$0.83
June 19	1.35	1.20	1.20	0.88	0.83	0.83
June 20	1.35	1.20	1.20	0.88	0.83	0.83
June 21	1.35	1.20	1.20	0.88	0.83	0.80
June 23	1.35	1.20	1.20	0.88	0.83	0.83
June 24	1.35	1.20	1.20	0.88	0.83	0.83

Jacob C. Beisel, Elmer L. Kidney, David G. Knettel, Claudius B. Sharp and Richard Jones will make application on June 16 for the incorporation of the Federal Machinery Company of Allegheny.

Pittsburg Items.

W. W. Lawrence & Company, paint manufacturers, this city, have let contracts, through William Glyde Wilkins, consulting engineer, for its new plant to be built in West Carson street, South Side. It will be a six story building, 100x170 feet, and will cost $150,000. Contracts for equipment are being let.

The Stilwell-Bierce & Smith-Vaile Company, through its Pittsburg office, has just sold to the Pittsburg Plate Glass Company for its Ford City works and water works plant five vertical single acting triplex pumps of 2,000,000 gallons capacity each. These pumps are to be direct connected with Westinghouse gas engines of 90 horse power.

The G. L. Bollinger Company, iron and steel structural work, this city, has completed a part of its new plant at Verona, and will put it in operation next week. The company will use its Verona shop for heavy work while the Pittsburg shops will be employed on light work. Among recent orders reported is one from the Meadville Distilling Company, Meadville, for a large warehouse, to be a duplicate of one recently built by the company at Meadville.

The Fort Pitt Forge Company, this city, has just completed a further extension to its plant in Liberty avenue to care for its increasing trade in rivets forgings and upsets. The company is employing part of its plant in upseting 250 tons of 2½ inch, 30 foot, truss rod to be used on a large bridge being built in New York. The rods are being upset to three inches.

The Crescent Electric Company, Twenty-fourth street and Liberty avenue, this city, is in the market for a 20 or 24 inch engine lathe. The company has completed a two story 24x48 foot extension to its plant, to be used as an electrical repair department.

The Metal Markets.

LONDON—Tin—£129-£119 10s. Sales 260 tons spot; 1,200 tons futures.

Copper—£54 7s 6d-£53 7s 6d. Sales 1,325 tons spot; 900 tons futures.

Lead—£11 5s-£11 3s 9d.

Spelter—£18 15s-£18 12s 6d.

NEW YORK—Tin—$29.30-$28.00.

Copper—Lake, $12.50; electrolytic, $12.25-$12-12¾; casting, $12.25-$12.12½.

Lead—$4.15.

Spelter $5.00-$4.87½.

ST. LOUIS—Lead—$4.00-$3.95.

Spelter—$4.60.

Aluminum Prices.

No. 1, 99 Per Cent. Pure in Ingots.

Small lots.......37c. pr lb.	1000 lb. to ton lots..... 34c.
100 lb. " ....35c. "	ton lots and over......33c.

No. 2, 90 Per Cent. Pure in Ingots.

Small lots.......34c. pr. lb.	1000 lb. to ton lots......32c. pr. lb.
100 lb. " ....33c. "	ton lots and over......31c. "

Nickel Aluminum Casting Metal.

Small lots.......39c. pr. lb.	1000 lb. to ton lots......34c. pr. lb.
100 lb. " ..... .35c. "	ton lots and over......33c. "

Special Casting Alloy, 80 Per Cent. Aluminum.

Small lots.......35c. pr. lb.	1000 lb. to ton lots..... 29c. pr. lb.
100 lb. " ....30c. "	ton lots and over......27c. "

Aluminum Castings from 45c. per lb. upward.

Rolled squares, angles, beams, hexagon bars, and other sections in orders of not less than 1,000 pounds at a time $1.00 per lb.; large orders special discount. Sawed squares or flat strips, 75 cents per lb.

Aluminum Bronze Paint, $1.35 per lb., in small lots; lot of 100 pounds, $1.10 per lb.: special price on large lots

Tin Plate.

American Coke Tins, I. C., 14x20—from store at New York—Bessemer Steel, full weight	$4 55
Bessemer Steel, 100 lbs.	4 40
Bessemer Steel, 95 lbs.	4 35
Bessemer Steel, 90 lbs.	4 30
American Charcoal Terne—I. C., 14x20 ordinary	4 50
I. C., ordinary	9 00

American Coke, f. o. b. mill, quoted at $4.25 for full weight 14x20; $4.10 for 100 lbs.; $4.05 for 95 lbs., and $4 00 for 90 lbs.

Foreign Coke Tins, I. C., 14x20 (for importation,) Bessemer Steel, full weight, $4.90 Bessemer Steel, 100 lbs. $4 75

Wire and Nails.

Wire, plain, car lots, jobbers	$2 50
Galvanized, car lots, jobbers	2 45
Wire, plain, less than car lots, jobbers	2 15
Galvanized, less than car lots, jobbers	25
Wire, plain, car lots, retailers	2 15
Galvanized, car lots, retailers	2 55
Wire, plain, less than car lots, retailers	2 20
Galvanized, less than car lots, retailers	2 70
Wire nails, car lots, jobbers	2 05
Wire nails, less than car lots, jobbers	2 15
Wire nails, car lots, retailers	2 15
Wire nails, less than car lots, retailers	2 25
Cut nails, car lots, jobbers	1 10
Cut nails, less than car lots, jobbers	1 15
Cut nails, car lots, retailers	1 23
Cut nails, less than car lots, retailers	2 55

Metals—New York.

The following are dealers' buying prices

Copper, heavy cut	11.00	c
Copper, light bottoms	9.50	c
Heavy Composition	11.00	c
Brass Turnings	7.00	c
Heavy Brass	8.00	c
Light Brass	6.75	c
Heavy Lead	3.80	c
Tea Lead	3.60	c
Zinc Scrap	3.25	c
No. 1 Pewter	21 50	c

A MATTER OF HISTORY.

The Chicago, Milwaukee & St. Paul Railway, popularly known as "The St. Paul Road," began the use of electricity for train lighting in 1888. In that and many ways it has been a poineer in the adoption of comforts for the traveler. In building the world famous Pioneer Limited trains a mark was set in luxury and beauty of cars that has never been equaled, and probably never will be.

"STEVEDORE"

Trade Mark.

ROPE

FOR TRANSMISSION AND HOISTING.

Made from the finest cut Manila stock. Particular care taken to have the twist of the threads and the lay of the strands exactly suited to the work to be done. A plumbago lubricant used in laying up this rope reduces the internal friction and makes the rope nearly waterproof. We guarantee that more work can be done with it in proportion to its cost than with any other rope on the market.

C. W. Hunt Co.,

West New Brighton, N. Y.

Pittsburg Office, - - 515 Penn Avenue.

SPECIAL MACHINERY

Of Every Description, Designed and Built.

Tool and Die Making.

Electrical and Mechanical Experimenting Work.

Metal Spinning, Stamping, Forming and Metal Patterns.

"Rapid" Tool & Machine Co.,

4-818 Broadway, - - Cincinnati, Ohio.

The Cochrane Heater

Forms an admirable receptacle for the condensation from heating coils for all high pressure drips, such as steam jackets, re-heating receiver, high pressure piping drains, etc. In the "COCHRANE" Heater they mingle with the fresh boiler feed-water and are pumped to the boilers without loss of heat or water. With a closed heater a drip tank, with a special pump and other apparatus likely to get out of order, is needed.

Do you wonder why we have so many second orders for our "COCHRANES?"

Ask for Catalogue "2-H."

Harrison Safety Boiler Works

N. Seventeenth St., Philadelphia, Pa.

Trade Mark.

WHY

Is the Blake Steam Pump pre-eminent?

BECAUSE

When Once Used, We Have Never Failed to Retain the Customer.

Sold By This House for 30 Years.

FRICK & LINDSAY CO.,

109-111 Wood St., Pittsburg, Pa.

Scaife Company's Late Sales.

The We-Fu-Go and Scaife water softening and purifying systems are manufactured only by William B. Scaife & Sons Company, this city. The We-Fu-Go is a cold intermittent system, formerly manufactured by the We-Fu-Go Company, of Cincinnati, O. This company has been absorbed by William B. Scaife & Sons Company. The Scaife method is a hot continuous system. The following are some of the contracts recently closed by the Scaife company:

The Hecla Portland Cement & Coal Company, North Bay, Mich., 1,500 P; the Hecla Portland Cement & Coal Company, West Branch, Mich., 600-P; the Isaac Harter Company, Fostoria, O., 1,000 H. P; A. A. Simmonds & Son, Dayton, O., 200-P; American Sheet Steel Company, New Philadelphia, O., 1,300-P; National Mining Company, Pittsburg, 1,000-P; Antrim Iron Company, Mancelona, Mich., 1,500-P; Ashtabula Worsted Mills Company, Ashtabula, O., 96,000 gallons per day. W. D. Boyce Paper Mills Company, Marseilles, O., 1,250,000 gallons per day.

These systems are built for any industrial purpose, and for any capacity.

Ore Situation at Cleveland.

The week closed with conditions eminently more satisfactory to both the shippers and the vessel owners than when it opened. The boats are getting better dispatch than ever before at any time this season, and the material, in consequence, is coming forward with more pronounced satisfaction to all concerned. With this speed of shipment maintained throughout the month June will show better returns, the Soo being taken into consideration, than the month of May, which was phenomenal in its results. The shippers aimed at the 4,000,000 tons mark in May, and, while they missed it woefully, they made better progress than during any similar month in the history of the ore-carrying trade. June last year was exceptional in a way, while not coming up to July, but it is confidently expected by some that June this year will exceed July of last, if it does not come fully up to the May calculations of this year in seeing 4,000,000, tons sent down the lake.

The same speed of shipment maintained throughout the year means a 25,000,000 tons movement during the 12 months, and this is a little more than the shippers have bargained for, as that amount has not been sold nor could it be used with the present furnace capacity. The Canadian ore importations must also be taken into account in this business, and this being considered, the shippers stand a fair prospect of overstepping the needs if the present movement is maintained. The impeding [illegible] will be forth coming soon, however, when the coal trade becomes more brisk and when the grain shippers begin to show a lively shipment and lumber trade reclaims some of the [illegible] that have been shifted into the carriage of [illegible]

Industrial Notes.

The Hayden-Corbett Chain Company, of Columbus, O., has been incorporated with $[illegible] capital stock and elected officers as follows: president, W. C. Brown; vice-president, W. S. Hanna; treasurer, John W. Doges; secretary, W. H. Hayden; and general manager, John T. Corbett, who with John W. Hayes, J. D. Price, W. H. Andrews, H. C. Goodman and W. C. [illegible] form the board of directors. The company has secured several acres of ground on the outskirts of Columbus and will start work at once upon the construction of two buildings, each 50x300 feet. The output of the plant when completed, about the first of October, will be about 400 tons of machine and hand made chain, per month. John T. Corbett, general manager, has had a number of years of experience in chain making with the P. Hayden Saddlery Hardware Company and with the Standard Chain Company since its acquisition of the Hayden company's plant.

The Cincinnati Industrial Bureau, Cincinnati, O., in conjunction with the Manufacturers' Club and Board of "Trade of that city, have before them a proposition to furnish capital for a large steel works to be located there. It is expected that the capital for the enterprise will be forth coming. Colonel E. P. Wilson, secretary of the organizations has the matter in charge.

American Manufacturer and Iron World

Vol. 70. No. 2. PITTSBURG, PA. JANUARY 9, 1902.

David Lamond. David D. Lamond.

D. LAMOND & SON,

Successors to DAVID LAMOND,

Engineers and Contractors,

Blast Furnace Construction.

All Kinds of

Fire Brick Work.

Sole Agents for the

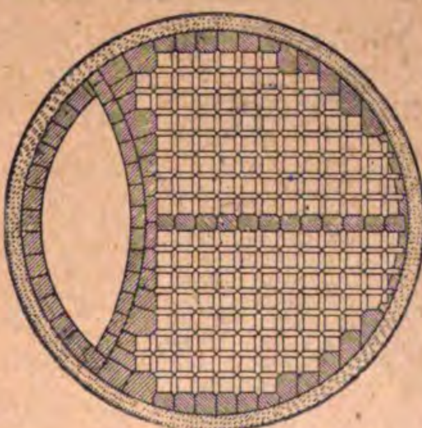
C. H. Foote

Patent

Fire

Brick

Stoves.



Enlarged Cross Section 20-ft. C. H. Foote Fire Brick Stove with D. Lamond Patent Improvements.

Offices:

FERGUSON BLOCK,

Pittsburg, Pa.

Bell Telephone 2575 Court.

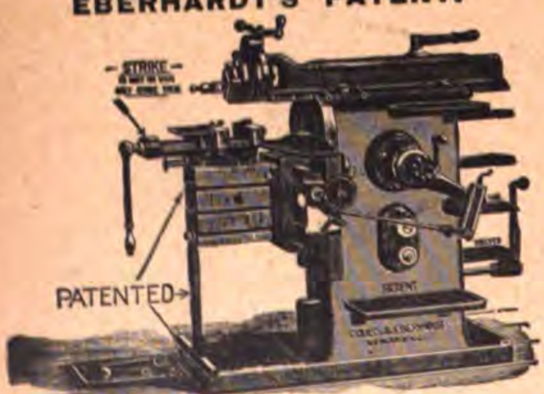
V A L V E S

Lunkenheimer Valves are made in endless variety for every requirement, in standard sizes, in bronze and iron, for medium and extra heavy pressures. None but high grade materials and skilled workmanship enter into their makeup. Subjected to rigid test and inspection before shipment. Specify "Lunkenheimer" make and order from your dealer. Write for Catalogue.

The Lunkenheimer Company, Main Office and Works: CINCINNATI, O., U. S. A.

BRANCHES: New York, 26 Cortlandt St.; London, 35 Great Dover St.

EBERHARDT'S PATENT.



DOUBLE TRIPLE QUICK STROKE
(TRADE MARK)

EXTENSION BASE (Trade Mark.)

SHAPERS.

Patent New Type
GEAR CUTTERS.

GOULD & EBERHARDT,

NEWARK, N. J., U. S. A.

AGENTS:—
U. BAIRD MACHINERY CO., Pittsburg, Pa.
MANNING, MAXWELL & MOORE, New York.
MARSHALL & HUSCHART MACHINERY COMPANY, Chicago, Cleveland and Cincinn

McLANAHAN-STONE MACHINE CO., ENGINEERS AND MANUFACTURERS.

GAYSPORT FOUNDRY, HOLLIDAYSBURG, PA.

ORE JIGS,

IMPROVED Washers for Phosphate, Iron and Mangan Ores with Wood or Steel Logs. Screens, Elevators, Convey ors, Picking Belts. Plans for complete Plants for Washing and Dressing Ores and Phosphates at least cost.

American Manufacturer and Iron World

Vol. 70. No. 3. PITTSBURG, PA. JANUARY 16, 1902.

THE LUNKENHEIMER SPECIALTIES


Antwerp 1894.


Paris 1900.

honestly made and always of good value; wherever exhibited, invariably carry of the highest honors. Specify "LUNKENHEIMER" make and order from your dealer. Write for catalogue of superior brass and iron valves, whistles, injectors, lubricators, oil pumps, oil and grease cups, etc. All goods tested and inspected, and warranted to satisfy.

The Lunkenheimer Co.,

CINCINNATI, O., U. S. A.

BRANCHES:

NEW YORK: 26 Cortlandt Street.
LONDON: 35 Great Dover Street.


Cincinnati 1874-5.


Buffalo 1901.


Omaha 1898-9.


Chicago 1893.


New Orleans 1876.


Selma 1873.


Philadelphia 1876.

SAND SIFTER

BROOKLYN, E. D.,
Oct. 26, 1897.

Messrs. Gould & Eberhardt,
Newark, N. N-

Gentlemen:—As to the working of the Sand Sifter, it is more than satisfactory. After using a shaker, which not only shook the sand, but shook itself apart periodically, it is a great relief, doing its work quietly and thoroughly, and we shall be pleased to recommend it to any one you may refer us to

Yours truly, BELL & FYFE FOUNDRY CO.

Gould & Eberhardt,

Newark, N. J., U. S. A.

U. Baird Machinery Co., Agents, Pittsburg. Pa.

Burden's Horse Shoes

"Burden Best" Iron.

Boiler Rivets.

The BURDEN IRON CO.

TROY. N. Y.

Pittsburgh Shear Knife & Machine Company,

47th. St. & A. V. Ry., PITTSBURGH, PENN'A.

SOLID STEEL SHEAR KNIVES

OF EVERY DESCRIPTION.

...gs, Rough, Turned or Finished Complete, Steam Hammers. Punches and Shears. Special Machinery

American Manufacturer and Iron World

Vol. 70. No. 4. PITTSBURG, PA. JANUARY 23, 1902.

American Manufacturer and Iron World

Vol. 70. No. 5. PITTSBURG, PA. JANUARY 30, 1902.

THE LUNKENHEIMER REGRINDING VALVES.

MADE OF GUN METAL,

Are unsurpassed where thorough, reliable service is the first requisite. In screw and flange ends for 200 to 250 lbs. working pressure, ⅛ to 4 inches.

A trial order demonstrates their peculiar fitness and invariably results in their adoption. These valves are extensively used and in continuous service on war vessels of the United States Navy, Locomotives, Lake and River Boats, Factories, Mills, Power Plants, etc. Specify LUNKENHEIMER make and order from your dealer.

WRITE FOR CATALOG.

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Sole Makers and Patentees,

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Branches:

New York, 26 Cortlandt Street.

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Burden's Horse Shoes

"Burden Best"

Iron.

Boiler Rivets.

The BURDEN IRON CO.

TROY. N. Y.

SAND SIFTER

BROOKLYN, E. D.
Oct. 26, 18[illegible]

Messrs. Gould & Eberhardt,
Newark, N. J.

Gentlemen:—As to the working of the Sand Sifter, it is more than satisfactory, after using a shaker, which not only shook the sand, but shook itself apart periodically. It is a great relief, doing its work quickly and thoroughly, and we shall be pleased to recommend it to any one you may refer to us.

Yours truly, BELL & FYFE FOUNDRY CO.

Gould & Eberhardt,

Newark, N. J., U. S. A.

U. Baird Machinery Co., Agents, Pittsburg, Pa.

Pittsburgh Shear Knife and Machine Co.,
47th St. and A. V. Ry.,
PITTSBURGH, PA.

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Rough Turned or Finished Complete.

Solid Steel,
Shear Knives,
Steam Hammers,
Punches and Shears.
SPECIAL MACHINERY

American Manufacturer and Iron World

Vol. 70. No. 6. PITTSBURG, PA. FEBRUARY 6, 1902.

American Manufacturer and Iron World

Vol. 70. No. 7. PITTSBURG, PA. FEBRUARY 13, 1902.

American Manufacturer and Iron World

Vol. 70. No. 8. PITTSBURG, PA. FEBRUARY 20, 1902.


High Voltage Lamps

OUR SPECIALTY.

Any Candle Power,
Voltage or Efficiency.

Highest in Economy.

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Perfect Vacuum.

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Highest in Maintenance of Candle Power.

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Prompt Shipment.

Guaranteed to Give Satisfaction.

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Careful Selections.

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Write for Information and Prices.

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BELL PHONE - - 1599 COURT.
P. & A. PHONE - - 1376 MAIN.


The LUNKENHEIMER "Duro"
Blow-Off Valve

with Self-Cleaning Seat, is built upon lines radically different from any other It solves the blow-off valve question and supplies the demand for a durable and absolutely reliable valve.

The steam jet, blowing over seating surfaces before contact, cleanses them from scale, sediment, etc., and these kept off seating surfaces, there is nothing present to cut and wear out the valve.

When worn any part can be replaced, built on the interchangeable plan. The entire design is massively substantial and admits of use under the heaviest pressures and severest conditions. Warranted to satisfy. In sizes from $1\frac{1}{4}$ to 3 inches in screw or flange ends. Specify the "Duro" and order from your dealer.

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CINCINNATI, O., U. S. A.

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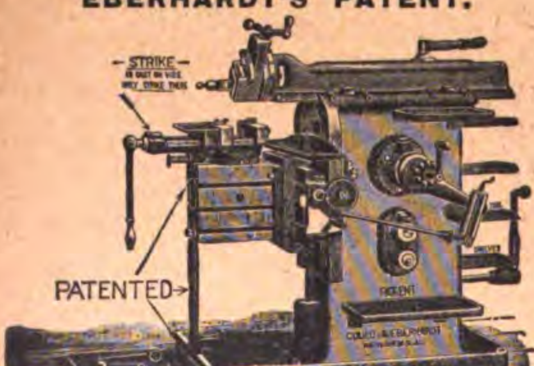
NEW YORK: 26 Cortlandt St., **LONDON:** 35 Great Dover St.

EBERHARDT'S PATENT.



DOUBLE TRIPLE QUICK STROKE
(TRADE MARK)

EXTENSION BASE (Trade Mark.)

SHAPERS.

Patent New Type

GEAR CUTTERS.

GOULD & EBERHARDT,

NEWARK, N. J., U. S. A.

AGENTS:—

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GAYSPORT FOUNDRY, HOLLIDAYSBURG, PA.

IMPROVED Washers for Phosphate, Iron and Manganese Ores with Wood or Steel Logs. Screens, Elevators, Conveyors, Picking Belts. Plans for complete Plants for Washing and Dressing Ores and Phosphates at least cost.

American Manufacturer and Iron World

Vol. 70. No. 9. PITTSBURG, PA. FEBRUARY 27, 1902.

Ideal Apollo Jewel Tiger Marine Rex Gem

Use Grease or Oil and Lunkenheimer Cups

and you will have bearings lubricated to your entire satisfaction. Endorsed by millions of satisfied users. Specify them and order from your dealer. Write for catalog of Brass and Iron Engineering Appliances of superior quality.

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Pioneer Crown Miami Royal Engine (Cody) Shafting Champion Sentinel

SAND SIFTER

BROOKLYN, E. D.,
Oct. 26, 1897.

Messrs. Gould &
Eberhardt,
Newark, N. N-

Gentlemen:—As to the working of the Sand Sifter, it is more than satisfactory. After using a shaker, which not only shook the sand, but shook itself apart periodically, it is a great relief, doing its work quietly and thoroughly, and we shall be pleased to recommend it to any one you may refer us to

Yours truly, BELL & FYFE FOUNDRY CO.

Gould & Eberhardt,

Newark, N. J., U. S. A.

U. Baird Machinery Co., Agents, Pittsburg, Pa.

Burden's Horse Shoes

"Burden Best"

Iron.

Boiler Rivets.

The BURDEN IRON CO.

TROY, N. Y.

Pittsburgh Shear Knife
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47th St. and A. V. Ry.,
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Rough Turned or Finished Complete.

Solid Steel,
Shear Knives,
Steam Hammers,
Punches and Shears.
SPECIAL MACHINERY

American Manufacturer and Iron World

Vol. 70. No. 10. PITTSBURG, PA. MARCH 6, 1902.

American Manufacturer and Iron World

Vol. 70. No. 11. PITTSBURG, PA. MARCH 13, 1902.

Senior. Junior. Spray Feed. Joker. Mars. Oil Pump.

The Lunkenheimer Lubricators

Are endorsed and liberally used by intelligent steam users everywhere. If you want perfect working and reliable cups, specify **LUNKENHEIMER** make and order from your dealer.

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Branches: 26 Cortlandt St., N. Y. **35 Great Dover St., London, S. E.**

Burden's Horse Shoes

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Boiler Rivets.

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47th. St. & A. V. Ry., PITTSBURGH, PENN'A.

SOLID STEEL SHEAR KNIVES

OF EVERY DESCRIPTION.

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American Manufacturer and Iron World

Vol. 70. No. 12. PITTSBURG, PA. MARCH 20, 1902.

PLAIN WHISTLE.
1 to 10 inches
diameter of bell.

SINGLE BELL
CHIME WHISTLE.
$1\frac{1}{2}$ to 10 inches.

MOCKING BIRD
WHISTLE.
$2\frac{1}{2}$ to 6 inches

FIRE ALARM
WHISTLE.
$2\frac{1}{2}$ to 8 inches.

The Lunkenheimer Steam Whistles Are warranted to blow and satisfy the most exacting. All goods tested and warranted first-class. Specify Lunkenheimer make and order from your dealer. Write for catalog of superior brass and iron engineering appliances.

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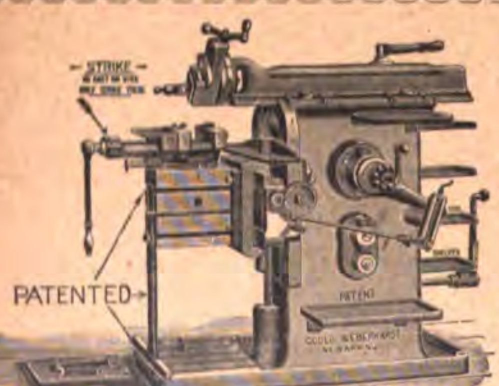
Branches: 26 Cortlandt St., N. Y. **35 Great Dover St., London, S. E.**



DOUBLE TRIPLE QUICK STROKE
(TRADE MARK)

EBERHARDT'S PATENT.

EXTENSION BASE (Trade mark.)

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A little higher priced, perhaps, than some others, but there's a good reason for it—the quality will be remembered long after the price is forgotten.

Upright Drill Presses, Gear and Rack Cutting Machines and Accessories.
HIGH-CLASS MACHINE TOOLS.

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- W. R. Colcord, Machinery Co., St. Louis.
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ORE JIGS,

GAYSPORT FOUNDRY, HOLLIDAYSBURG, PA.

IMPROVED Washers for Phosphate, Iron and Manganese Ores with Wood or Steel Logs. Screens, Elevators, Conveyors, Picking Belts. Plans for complete Plants for Washing and Dressing Ores and Phosphates at least cost.

American Manufacturer and Iron World

Vol. 70. No. 13. PITTSBURG, PA. MARCH 27, 1902.

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American Manufacturer and Iron World

Vol. 70. No. 14. PITTSBURG, PA. APRIL 3, 1902.

American Manufacturer and Iron World

Vol. 70. No. 15. PITTSBURG, PA. APRIL 10, 1902.

American Manufacturer and Iron World

Vol. 70. No. 16. PITTSBURG, PA. APRIL 17, 1902.

American Manufacturer and Iron World

Vol. 70. No. 17. PITTSBURG, PA. APRIL 24, 1902.

The Lunkenheimer "CLIP" Gate Valve

SINGLE DISC, DOUBLE SEATED

In Screw Ends, from ½ to 6-Inch Sizes.
In Flange Ends, from 2 to 6-Inch Sizes.

Best in quality, lowest in price, the engineer's favorite. These Valves are made of cast iron and all wearing parts of gun metal. They are superior to common, cheap brass valves. **Why?** *Because* they possess all the advantages of a cast-iron pipe fitting, are heavy and rigid — not injured by expansion and contraction or rough handling in pipe fitting. *Take pressure from either end.* Body and hub held together by a steel clip, consequently always easily taken apart. Joint between body and hub made permanent by an imbedded seamless oval copper wire washer. If you desire the *best, strongest* and *most durable* valve for general purposes, on all ordinary pressures, use this valve. *Fully warranted to satisfy.* Made also in All Iron for Cyanide and other acids. Specify them and order through your dealer. Write for catalogue. Sole Makers and Patentees,

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BRANCHES: New York, 26 Cortlandt St., London, 35 Great Dover St.

Trade Mark.

THE WORLD MOVES.

So Do We—Across the Street.

Nos. 109-111 Wood Street,

APRIL 1, 1902.

FRICK & LINDSAY CO.,

200 Wood St., Pittsburg, Pa.

Pittsburgh Shear Knife & Machine Company,

47th. St. & A. V. Ry., PITTSBURGH, PENN'A.

SOLID STEEL SHEAR KNIVES

OF EVERY DESCRIPTION.

Forgings, Rough, Turned or Finished Complete. Steam Hammers. Punches and Shears. Special Machinery

American Manufacturer and Iron World

Vol. 70. No. 18. PITTSBURG, PA. MAY 1, 1902.

The Lunkenheimer "CLIP" Gate Valve

SINGLE DISC, DOUBLE SEATED

In Screw Ends, from ½ to 6-inch Sizes.
In Flange Ends, from 2 to 6-inch Sizes.

Best in quality, lowest in price, the engineer's favorite. These Valves are made of cast iron and all wearing parts of gun metal. They are superior to common, cheap brass valves. **Why?** *Because* they possess all the advantages of a cast-iron pipe fitting, are heavy and rigid — not injured by expansion and contraction or rough handling in pipe fitting. *Take pressure from either end.* Body and hub held together by a steel clip, consequently always easily taken apart. Joint between body and hub made permanent by an imbedded seamless oval copper wire washer. If you desire the *best, strongest* and *most durable* valve for general purposes, on all ordinary pressures, use this valve. *Fully warranted to satisfy.* Made also in All Iron for Cyanide and other acids. Specify them and order through your dealer. Write for catalogue. Sole Makers and Patentees,

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THE WORLD MOVES.

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American Manufacturer and Iron World

Vol. 70. No. 18. PITTSBURG, PA. MAY 1, 1902.

American Manufacturer and Iron World

Vol. 70. No. 19. PITTSBURG, PA. MAY 8, 1902.

American Manufacturer and Iron World

Vol. 70. No. 21. PITTSBURG, PA. MAY 22, 1902.

American Manufacturer and Iron World

Vol. 70. No. 22. PITTSBURG, PA. MAY 29, 1902.

American Manufacturer and Iron World

Vol. 70. No. 23. PITTSBURG, PA. JUNE 5, 1902.

American Manufacturer and Iron World

Vol. 70. No. 24. | PITTSBURG, PA. | JUNE 12, 1902.

THE LUNKENHEIMER

Flange Ends, with Outside Screw and Yoke with By-Pass.

The Lunkenheimer Victor Gate Valves are modern high-pressure valves, strictly first-class and constructed to give satisfaction. Made in standard sizes from 2 in. up, in screw and flange ends, with stationary or rising spindles, with and without by-pass, for 175 lbs. working pressures. Wearing parts made of bronze. Compact, heavy, durable, low priced.

Specify the "Victor," warranted to satisfy. Write for catalogue of high-grade Brass and Iron Engineering Specialties.

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BRANCHES:
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Flange Ends, Stationary Spindle, no By-Pass.

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Steam Hammers of Every Description

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American Manufacturer and Iron World

Vol. 70. No. 25. PITTSBURG, PA. JUNE 19, 1902.

American Manufacturer and Iron World

Vol. 70. No. 26. PITTSBURG, PA. JUNE 26, 1902.

A STRICTLY HIGH-GRADE, UP-TO-DATE, GUARANTEED MACHINE.

LUNKENHEIMER STANDARD INJECTOR '99 MODEL

Note what it will do: With feed water at 75° F., lift 6 feet, it will work **without adjustment of steam or water at all pressures from 40 to 250 lbs. and higher, and the capacity can be graded over 50 per cent. at any point in that range of work.** All parts are easily accessible and tubes are very durable. It is thoroughly reliable and can be started promptly under the most extreme conditions, and *unlike* many others its efficiency is not confined to any particular season of the year. The capacity increases with the pressure. A trial is solicited and satisfaction guaranteed. Write for catalogue of Superior Brass and Iron Steam Specialties.

THE LUNKENHEIMER CO., ***Sole Makers and Patentees***
Main Office and Works: **CINCINNATI, OHIO, U. S. A.**
BRANCHES: 26 Cortlandt Street, NEW YORK; 35 Great Dover Street, S. E., LONDON

Steam Hammers of Every Description

Pittsburg Shear Knife & Machine Company,
47th Street and A. V. Ry., Pittsburgh, Pa.

McLANAHAN-STONE MACHINE CO., ENGINEERS AND MANUFACTURERS

ORE JIGS,

GAYSPORT FOUNDRY, HOLLIDAYSBURG, PA.

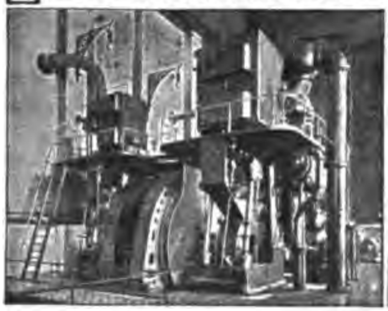
IMPROVED Washers for Phosphate, Iron and Manganese Ores with Wood or Steel Logs. Screens, Elevators, Conveyors, Picking Belts. Plans for complete Plants for Washing and Dressing Ores and Phosphates at least cost.

Fischer Foundry & Machine Co.

Rolling Mill, Hydraulic, Tube Mill and General Machinery. High Class Jobbing Foundry Work.

South Twenty-first St., PITTSBURG, PA.

·SOUTHWARK·FOUNDRY·&·MACHINE·CO·



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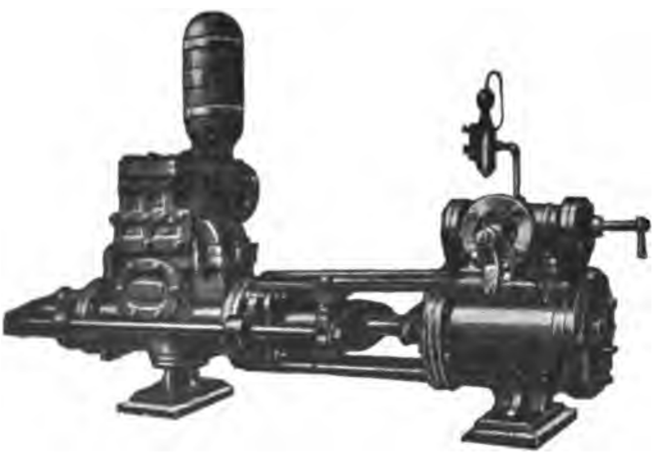
SOLE BUILDERS OF THE

PORTER ALLEN ENGINE

ADAPTED TO EVERY CLASS OF SERVICE

···BLOWING ENGINES····

WEISS CENTRAL CONDENSING PLANTS.



Yough Pumps

In Double Plunger and Piston Patterns.

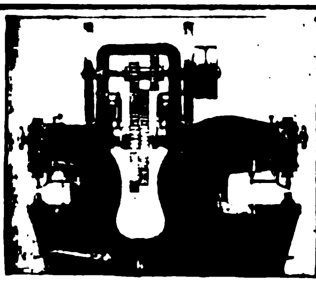
Mine, Special Boiler Feed Electric Power, Tank, Rolling Mill and Blast Furnace

PUMPS.

Pumps made for all kinds of service and for continuous pumping.

Boyts, Porter & Co.,

Connellsville Pa.



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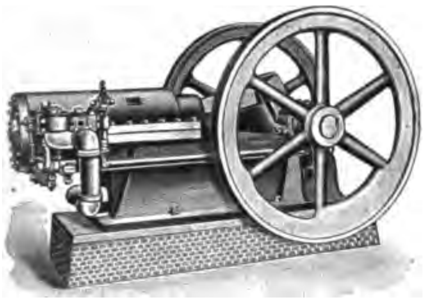
OF EVERY DESCRIPTION.

Vertical, Horizontal, Multiple PUNCHES, Plate and Sheet SHEARS.
Improved BORING MILLS from 36-inch to 72 inch.
Latest Improved Designs; Best Workmanship; Material Guaranteed.

The Wais-King Tool Company,

WINTON PLACE, O., (Cincinnati Suburb.)



"New Era" Gas Engines,

Sizes 5 to 125 horse-power. Strictly high-grade. Thoroughly guaranteed.

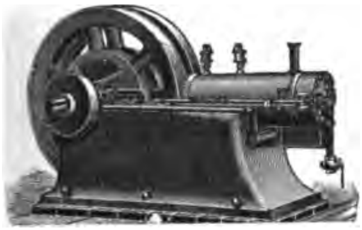
Pittsburg House:

FORCE & BRIGGS, Fourth Avenue and Liberty Street.

The New Era Iron Works Company,

No. 32 Dale Ave.. - - Dayton, Ohio.

THE "BRIGHTON" GAS ENGINE



BUILT FOR BUSINESS.

Has given entire satisfaction wherever installed.

It is the heaviest and strongest Gas Engine built, while the workmanship is of the highest grade.

For power and electric lighting purposes, it has no equal.

New Catalogue Just Issued.

Pierce-Crouch Engine Company.

Main Office and Works,
New Brighton, Pa.

Pittsburg Office,
Empire Building.

GAS AND GASOLINE ENGINES.

Do you want a Cheap and Convenient Power? Then write for our Catalog 22, stating use and horse power.

Columbus Machine Co.,
Columbus, O.

Brown Gas Engines

Are Simple, Economical and Reliable. For full information, address

Brown Gas Engine Co.,
232 North High Street,
COLUMBUS, O.

Machine Moulded Gearing for

Rolling Mills, Foundries, Factories, Etc

Castings Made for **Mills and Furnaces.**

Builders of the **Mertes Duplex Gas Engine.**

National Gear Wheel & Foundry Co.,

South Ave. and Walker St., Allegheny, Pa.

THE WARREN GAS ENGINE,

Awarded Gold Medal at Pan-American Exposition, 1901.

Single Cylinders, $3\frac{1}{2}$ to 90 Actual H. P.; Double Cylinders, 25 to 800 actual H. P. Inquiries solicited for large units to operate with natural, illuminating or producer gas.

STRUTHERS, WELLS & CO., Warren, Pa.

Sold by TRANTER-DAVISON MFG. CO.,

105 Water Street, Pittsburg, Pa.

United Engineering & Foundry Co.,

Vertical Shear.

Successors to McGill & Co., The Lloyd-Booth Co., Lincoln Foundry Co., Frank-Kneeland Machine Co., and Chilled Roll Foundry Co.

MANUFACTURERS OF

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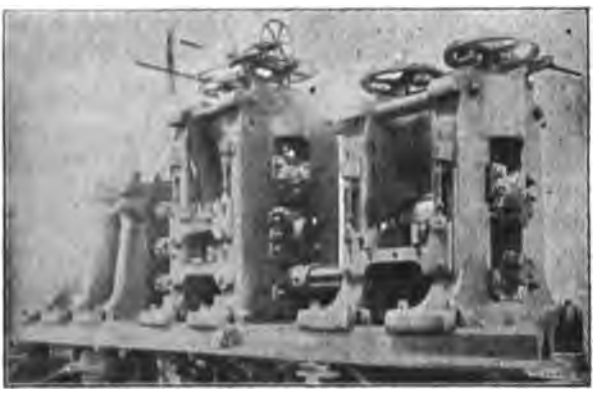

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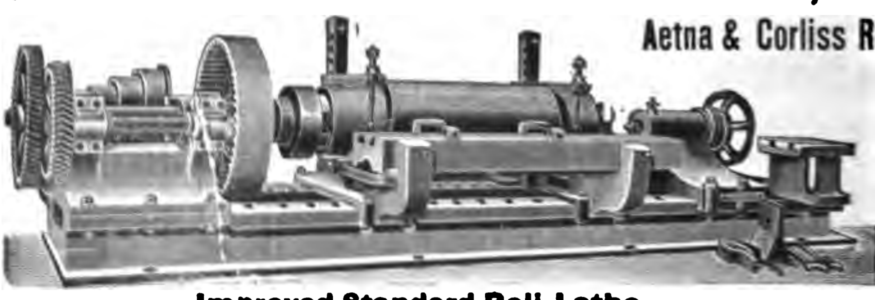

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Link Belting.
Link-Belt Eng. Co., Phila.
The Jeffrey Mfg. Co., Columbus, O.
U. Baird Mach. Co., Pbg., Pa.

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Ironsides Co., Columbus, O.
James Bonar & Co, Pittsburg, Pa.
Jos. Dixon & Co., Jersey City N.J.
Wisconsin Graphite Co., Pbg., Pa.

Lubricators and Oilers.
Wm. Powell Co., Cincin., O.
The Lunkenheimer Co., Cin., O.
J. D. McIlwain & Co., Pbg., Pa.

Machine Tools.
Reade Mach. Co, Cleveland, O.
Drezes, Mueller & Co., Cin., O.
U. Baird Mach. Co., Pbg., Pa.

Magnesia Covering.
Magnesia Covering Co., Pbg., Pa.
Philip Carey Mfg. Co., Pittsburg, Pa.

Malleable Foundries.
Northern Eng. Wks., Detroit, Mich.
Whiting Fdry. Equip. Co., Harvey, Ill.

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Iron City Eng. Co., Pbg., Pa.
Pbg. Con. & Eng. Co., Pbg., Pa.
Crocker-Wheeler Co., Ampere, N.J

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Clearfield Machine Shops, Ltd. Clearfield, Pa.
Mesta Mach. Co., Pbg., Pa.
Geo. A. Hogg I. & S. Fdry Co., Pbg., Pa.
McLanahan & Stone, Hollidaysburg.
Phillips & McLaren, Pbg., Pa.

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Brush & Stephens, Pbg., Pa.
Niles Boiler Co., Niles, O.
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The Ironsides Co., Columbus, O.
Wisconsin Graphite Co., Pbg., Pa.

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Allis-Chalmers Co., Milwaukee, Wis.

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Pbg Leather and Rubber Co., Pbg., Pa

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Chicago Pneumatic Tool Co., Chicago, Ill

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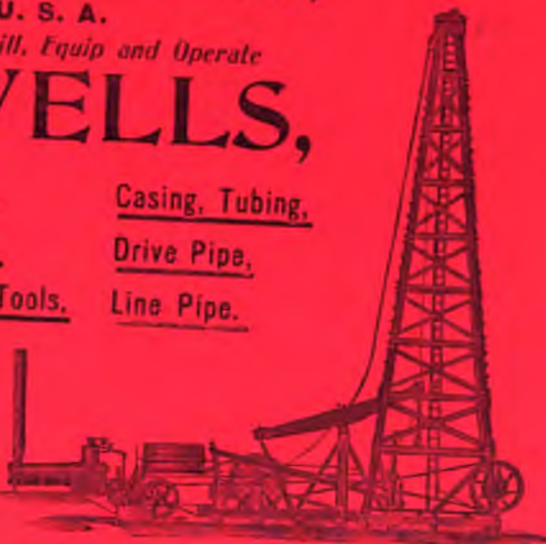

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